

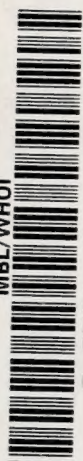








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DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

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7. BIND.



# DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

## SYVENDE BIND.

### ZOOLOGI.

#### Tunicata:

- ✓ 1. Synascidiæ . . . . . ved H. Huitfeldt-Kaas.
- ✓ 2. Ascidie simplices og Ascidie compositæ . . ved Kristine Bonnevie
- ✓ 3. Fortegnelse over Norges Ascidie simplices . af Johan Kiær.
- ✓ 4. Om Knopskydningen hos Distaplia Magnilarva  
og Pyrosoma Elegans . . . . . af Kristine Bonnevie.
- ✓ 5. Kimbladstudier paa Grundlag af Ascidiernes  
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- ✓ Polyzoa . . . . . ved O. Nordgaard.
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- ✓ Mollusca III . . . . . ved Herman Friele og James A. Grieg.  
Kemiske Undersøgelser af Skaller af Mollusker af L. Schmelck.

### BOTANIK.

#### Protophyta:

- Diatomaceæ, Silicoflagellata og Cilioflagellata . af H. H. Gran.



# THE NORWEGIAN NORTH-ATLANTIC EXPEDITION

1876—1878.

## SEVENTH VOLUME.

### ZOOLOGY.

#### Tunicata:

1. Synascidiæ . . . . . by H. Huitfeldt-Kaas.
  2. Ascidie simplices and Ascidie compositæ . . by Kristine Bonnevie.
  3. A List of Norwegian Ascidie simplices . . . by Johan Kiær.
  4. On Gemmation in Distaplia magnilarva and  
Pyrosoma elegans . . . . . by Kristine Bonnevie
  5. Germ-Layer Studies based upon the Development  
of Ascidians . . . . . by Johan Hjort.
- Hydroida . . . . . by Kristine Bonnevie.
- Polyzoa . . . . . by O. Nordgaard.
- Thalamophora . . . . . by Hans Kiær.
- Mollusca III . . . . . by Herman Friele & James A. Grieg.
- Chemical Examination of Shells of Mollusca. . by L. Schmelek.

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- Diatomaceæ, Silicoflagellata and Cilioflagellata . by H. H. Gran.

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Apparaterne og deres Brug.  
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Tunicata.  
Hydroida.  
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Mollusca III.  
Protophyta.



Med det 7de Bind af „den Norske Nordhavs-Expedition 1876—1878“ er Bearbejdelsen af det ved Expeditionen indsamlede Materiale og Offentliggjørelsen af de derved rundne Resultater afsluttet. Idet Redaktionskomiteen nedlægger sit Hverv, griber den Anledningen til paa den norske Naturvidenskabs Vegne at udtale en dybtfølt Tak til den kongelige Norske Regjering og Norges Storting, som med aabent Blik for Verkets nationale og internationale Betydning har sat det i Gang, fremmet dets Udførelse og bevilget Midlerne til dets tidsmæssige og fyldige Udstyr og Udgivelse, samt til de Videnskabsmænd, som med os har udarbejdet de i Verket indeholdte Afhandlinger og gjort det muligt, at det foreligger som et Arbejde udelukkende udført af norske Kræfter.

*Christiania, November 1901.*

Dr. **H. Mohn.**      Dr. **G. O. Sars.**

With the seventh volume of the ‘Norwegian North Atlantic Expedition, 1876—1878’, the working up of the material collected by the Expedition, and the publication of the results obtained therefrom, are brought to a conclusion. In resigning their office, the editorial committee take the opportunity of expressing on behalf of Norwegian natural science, their deep gratitude to the Norwegian Government and the Norwegian Storting, who, with a clear perception of its national and international importance, started the work, have furthered its execution, and have voted the means necessary for a get-up and publication of a complete and modern character, and also to those men of science who, with us, have prepared the memoirs contained in the volumes, and made it possible to produce it as a work written exclusively by Norwegian writers.

*Christiania: November, 1901.*

Dr. **H. Mohn.**      Dr. **G. O. Sars.**







DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

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ZOOLOGI.

SYNASCIDIÆ.

VED

H. HUITFELDT-KAAS.

MED 2 TAVLER.



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CHRISTIANIA.

GRØNDAHL & SØNS BOGTRYKKERI.

1896.



THE NORWEGIAN NORTH-ATLANTIC EXPEDITION  
1876—1878.

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ZOOLOGY.

SYNASCIDIÆ.

BY

H. HUITFELDT-KAAS.

WITH 2 PLATES.



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CHRISTIANIA.  
PRINTED BY GRØNDAHL & SØN.  
1896.







Det var oprindeligt min hensigt at udgive en fortegnelse over de norske synascidier baseret paa vore museums-samlinger. Til iværksættelsen af denne plan gennemgik jeg universitetsmuseets og Bergens museums synascidiesamlinger, der af bestyrerne velvillig stilledes til min disposition, hvorfor jeg herved frembærer min erkjendtligste tak.

Kun faa af disse samlingers talrige species var bestemt og ialmindelighed blot genus. Artsangivelse forekom næsten blot ved prof. M. Sars's type-exemplarer fra hans reise i Lofoten og Finmarken 1849. Hvad der forefandtes bestemt udenfor dette refererede sig til gamle usikre beskrivelser. Det viste sig derfor snart, at nogen fortegnelse over vore synascidier uddragen af disse samlinger alene ikke lod sig udarbejde, saa meget mere som materialet kun i de færreste tilfælde tillod nogen revideret bestemmelse i sin daværende forfatning. Synascidierne med sin bløde konsistens kræver nemlig en meget omhyggelig præparation og nogen saadan var sjelden foretagen, saaat den nødvendige detaillerede undersøgelse af dyrenes anatomi her ikke lod sig foretage. Ligeledes var farven gaaet tabt uden at være noteret. Denne spiller hos flere familier en meget fremtrædende rolle. Naar hertil kommer skrumpning og forandringer frembragte ved muskelcontraction i dødsoieblikket, vil vanskelighederne ved bestemmelsen blive iøjensynlige, især naar man ikke raader over en typesamling til sammenligning. En saadan har jeg derfor først maattet anlægge, hvorved jeg har kunnet undersøge dem i frisk tilstand og conservere dem paa en passende maade. Saaledes har jeg kunnet bestemme meget af museernes materiale ved at referere disses species til mine egne.

Den oprindelige plan blot at give en fortegnelse over de norske synascidier med beskrivelse af de nye arter har jeg fraveget, for saa vidt som jeg ogsaa har behandlet enkelte genera mere indgaaende, naar materialet dertil har givet mig anledning. Ialmindelighed har jeg anført de vigtigste karakterer for disse, og hvor der herskede nogen uklarhed i definitionen, en kort begrundelse af slægtens optagelse.

It had originally been my intention to publish a list of the Norwegian *Synascidiæ*, based upon the collections in our museums. In order to carry out this plan, I went through the collections of these animals in the University Museum, and the Bergen Museum, these collections being freely placed at my disposal by their respective directors, for whose courtesy in so doing, I would here express my most grateful acknowledgements.

Only a few of the numerous specimens in these collections have been determined at all, and most of these only as to genus. Any statement of the species was found, almost without exception, only in Prof. M. Sars's type-specimens from his journey in Lofoten and Finmark, in 1849. Whatever others were determined had reference to old, uncertain descriptions. It was therefore soon evident that it was not possible to prepare a list of our *Synascidiæ* taken from these collections alone, the more so as, in most cases, the specimens, in their present condition, did not allow of a revised definition. Synascidians, with their soft consistency, require very careful preparation, and this they have rarely received, so that the necessary particular examination of the anatomy of the animals was not possible here. The colour had also disappeared without having been recorded; and this, in many families, plays a very important part. When to this is added the shrinking and changes brought about by muscular contraction at the moment of death, the difficulties of determination will be apparent, especially when there is no type-collection at one's disposal for comparison. I have therefore first been obliged to make a collection, by means of which I could examine the animals in a fresh condition, and preserve them properly. I have thus been enabled to determine many of the museum specimens by comparison with my own.

I have departed from the original plan of only giving a list of the Norwegian Synascidians with descriptions of the new species, in as far as I have also given a more detailed account of some few genera, where the material for so doing has given me the opportunity. Of these I have generally stated the most important characters, and where any uncertainty in definition was apparent, a short argument for the admission of the genus.



Med hensyn til classification og nomenclatur har jeg i det hele og store taget fulgt Lahille (Recherches sur les tuniciers des côtes de France).

Af synonymer er kun de vigtigste medtagne.

Naar undtages prof. M. Sars's type-exemplarer er alle med en undtagelse (*aplidiopsis sarsii*) i fortegnelsen opførte arter og varieteter indsamlede af mig selv.

Største delen danner udbyttet af en med universitetsstipendium foretagen reise til Hardangerfjordens munding sommeren 1893 i den hensigt at gjøre studier over vore synascidier. Indsamlingerne blev foretagne ved Espevær, ved Bømmeloens sydspids, ved Mønstrevaag og Lervik paa Stordøen. En del synascidier er indsamlede paa en reise sommeren 94 Beian—Lofoten—Gjesvær (Finmarken).

En mindre synascidiesamling fra Upsala museum har ligeledes staaet til min disposition bestaaende af tildels meget vel konserveret materiale, hvorefter største delen er indsamlet i Bohuslän af hr. cand. Matis Floderus; alle arter er tillige kjendte fra den norske kyst.

Forøvrig har jeg kun benyttet nogle spredte observationer fra skrabninger i Christianiafjorden, ved Hvaløerne og ved Arendal; ligeledes er en del synascidier indsamlede mellem Egersund og Espevær vinteren 1893—94 af konservator ved det zoot. museum dr. Hjort mig velvillig overladte.

Fortegnelsen indbefatter 24 arter (og flere varieteter), hvorefter tidligere 9 er antegnede som norske; 8 er for videnskaben nye. De øvrige er kjendte fra de engelske, franske og italienske kyster. Hertil kommer endnu 4 usikre arter.

De i fortegnelsen ved en \* forsynede arter har jeg selv indsamlet.

- \*1. *Didemnoïdes variabile*, n. sp.
- \*2. *Didemnum roseum*, Sars.
- \*3. *Leptoclinum candidum*, Savigny.
- \*4. *Diplosoma* var. *gelatinosum-listeri*, Milne-Edwards.
- \*5. — *spongiforme* (typef.), Giard.
- \* — var. *carnosum-spongiforme*, Drasche.
- 6. *Distoma crystallinum*, Renier.
- 7. *Distaplia clavata*, Sars.
- 8. — *livida*, Sars.
- \*9. *Clavelina lepadiformis*, Müller.
- \*10. *Glossophorum sabulosum*, Lahille.
- 11. *Aplidiopsis pomum*, Sars.
- 12. — *sarsii*, n. sp.
- \*13. *Aplidium lacteum*, n. sp.
- \*14. — *flavum*, n. sp.
- \*15. *Amaroucium proliferum*, Milne-Edwards.
- 16. — *mutabile*, Sars.
- \*17. *Parascidium crispum*, n. sp.
- 18. *Synoicum incrustatum*, Sars.
- \*19. *Botryllus marionis*, Giard.
- \*20. — *violaceus*, Milne-Edwards.

With regard to classification and nomenclature I have generally followed Lahille (Recherches sur les Tuniciers des côtes de France).

Only the most important synonyms are included.

With the exception of Prof. M. Sars's type-specimens, all the species and varieties mentioned in this list, with one exception (*Aplidiopsis sarsii*), have been collected by myself.

The greater part of the collection is the result of a journey taken in 1893 at the expense of the University to the mouth of the Hardanger Fjord for the purpose of studying our Synascidians. Collections were made at Espevær, off the south point of Bømmeløen, at Mønstrevaag and Lervik on Stordøen. A few Synascidiæ were taken on a voyage, in the summer of 1894, to Beian, Lofoten and Gjesvær (Finmark).

A small collection of Synascidians, from the Upsala Museum, was also placed at my disposal, consisting of some, to a certain extent, very well preserved specimens, the greater part having been collected in Bohuslän by Mr. Matis Floderus. All the species are known from the Norwegian coast.

In addition to these, I have only made use of some scattered observations from dredgings in the Christiania Fjord, off the Hval Islands and Arendal. A few Synascidians taken between Egersund and Espevær in the winter of 1893—94, have also been kindly given to me by Dr. Hjort, the curator of the Zootomical Museum.

The list contains 24 species (and several varieties), of which 9 have been previously designated as Norwegian, 8 are new to science, and the remainder are known from the English, French and Italian coasts. To these must be added 4 more uncertain species.

The species marked with an asterisk in the list have been collected by myself.

- \*1. *Didemnoïdes variabile*, n. sp.
- \*2. *Didemnum roseum*, Sars.
- \*3. *Leptoclinum candidum*, Savigny.
- \*4. *Diplosoma* var. *gelatinosum-listeri*, Milne-Edwards.
- \*5. — *spongiforme* (type), Giard.
- \* — var. *carnosum-spongiforme*, Drasche.
- 6. *Distoma crystallinum*, Renier.
- 7. *Distaplia clavata*, Sars.
- 8. — *livida*, Sars.
- \*9. *Clavelina lepadiformis*, Müller.
- \*10. *Glossophorum sabulosum*, Lahille.
- 11. *Aplidiopsis pomum*, Sars.
- 12. — *sarsii*, n. sp.
- \*13. *Aplidium lacteum*, n. sp.
- \*14. — *flavum*, n. sp.
- \*15. *Amaroucium proliferum*, Milne-Edwards.
- 16. — *mutabile*, Sars.
- \*17. *Parascidium crispum*, n. sp.
- 18. *Synoicum incrustatum*, Sars.
- \*19. *Botryllus marionis*, Giard.
- \*20. — *violaceus*, Milne-Edwards.

- \*21. *Polycyclus fuscus* (typef), n. sp.  
 \* — — var. *inradiatus*, n. sp.  
 \* — — var. *rufus*, n. sp.  
 \*22. *Botrylloides parvulum*, n. sp.  
 23. *Sarcobotrylloides aureum*, Sars.  
 \*24. — *esperærense*, n. sp.

Hertil kommer endnu 4 usikre arter:

*Morchellium argus*, Milne Edwards.  
*Polycyclus renieri*, Lamarek.  
*Botryllus schlosseri*, Pallas.  
*Botrylloides albicans*, Milne-Edwards.

Tilslut maa jeg aflægge min ven dr. Johan Hjort min bedste tak, som under mit arbejde med synascidierne altid har staaet mig bi med raad og daad. Foruden arbejdsplads paa det zootomiske laboratorium og alle de til det indsamlede species benyttede hærtnings- og conserveringsvæsker har han ogsaa overladt mig en ikke ubetydelig samling synascidier indsamlede af ham selv.

#### Literatur.

Medens der for de norske monascidiere vedkommende allerede længe har foreligget forholdsvis rige bidrag i reiseindberetninger og lignende, har vore synascidier kun faaet en meget stedmoderlig behandling, idet der saavidt mig bekjendt blot paa 5 steder og leilighedsvis forekommer publikationer over norske synascidier. Aarsagen hertil maa vistnok hovedsagelig tilskrives den vanskelighed, bestemmelsen af disse frembyder.

I „Zoologia Danica“ nævner O. F. Müller og Rathke blandt tunicaterne: *ascidia lepadiformis* og *ascidia gelatina*, hvoraf den første er synonym med *clavelina lepadiformis* og den anden vistnok ogsaa er en *clavelina*.

Professor M. Sars anfører i sin „Beretning om en i sommeren 1849 foretagen zoologisk reise i Lofoten og Finnmarken“ følgende 10 arter som forekommende ved denne del af landets kyst:

*Botrylloides aurea*, Sars.  
*Didemnum gelatinosum*, M.-Edw.  
 — *roseum*, Sars.  
*Leptoclinum gelatinosum*, M.-Edw.  
 — *lividum*, Sars.  
 — *clavatum*, Sars.  
*Distomum vitreum*, Sars.  
*Amaroucium pomum*, Sars.  
 — *mutabile*, Sars.  
 — *incrustatum*, Sars.

Ved undersøgelse af typeexemplarerne har jeg fundet, at de som *didemnum gelatinosum*, M.-Edw. og *leptoclinum gelatinosum*, M.-Edw. bestemte species tilhører arter af 3 forskellige genera nemlig *didemnoides*, *leptoclinum* og *diplosoma*. *Distomum vitreum* er synonym med *distoma crystallinum*, Renier. Foruden disse 10 arter beskriver forfatteren løselig endnu 3 synascidier nemlig en liden *clavelina*-art med 6 rækker branchialstigmata, om hvilken han siger: „er maaske ungen af *clavelina lepadiformis*“, hvilket antallet

- \*21. *Polycyclus fuscus* (type), n. sp.  
 — — var. *inradiatus*, n. sp.  
 — — var. *rufus*, n. sp.  
 \*22. *Botrylloides parvulum*, n. sp.  
 23. *Sarcobotrylloides aureum*, Sars.  
 \*24. — *esperærense*, n. sp.

To these must be added 4 uncertain species:

*Morchellium argus*, Milne-Edwards.  
*Polycyclus renieri*, Lamarek.  
*Botryllus schlosseri*, Pallas.  
*Botrylloides albicans*, Milne-Edwards.

In conclusion, I would offer my best thanks to my friend Dr. Johan Hjort, for the assistance which he has always been ready to give me in word and deed during my work on the Synascidiæ. Besides room to work in the zootomical laboratory, and all the liquids used in hardening and preserving the specimens collected, he has also given me a by no means insignificant collection of Synascidiæ made by himself.

#### Bibliography.

While, as regards the Norwegian Monascidiæ, there have been comparatively rich contributions in the form of reports of voyages and the like, our Synascidiæ have received only a very indifferent treatment, there being, as far as I am aware, publications in only 5 places and incidentally, concerning the Norwegian Synascidiæ. The reason for this must probably be ascribed to the difficulty which their determination presents.

In „Zoologia Danica“, O. F. Müller and Rathke name among the Tunicata, *Ascidia lepadiformis* and *Ascidia gelatina*, the first of these being synonymous with *Clavelina lepadiformis* and the second also probably a *Clavelina*.

Prof. M. Sars, in his „Beretning om en i sommeren 1849 foretagen zoologisk reise i Lofoten og Finnmarken“, gives the following 10 species as occurring on that part of the coast of Norway:

*Botrylloides aurea*, Sars.  
*Didemnum gelatinosum*, M.-Edw.  
 — *roseum*, Sars.  
*Leptoclinum gelatinosum*, M.-Edw.  
 — *lividum*, Sars.  
 — *clavatum*, Sars.  
*Distomum vitreum*, Sars.  
*Amaroucium pomum*, Sars.  
 — *mutabile*, Sars.  
 — *incrustatum*, Sars.

On examining the type specimens, I have found that the specimens designated as *Didemnum gelatinosum*, M.-Edw. and *Leptoclinum gelatinosum*, M.-Edw. belong to species of 3 different genera, viz. *Didemnoides*, *Leptoclinum* and *Diplosoma*. *Distomum vitreum* is synonymous with *Distoma crystallinum*, Renier. In addition to these 10 species, the author cursorily describes 3 more Synascidiæ, one, a small species of *Clavelina* with 6 rows of branchial stigmata, concerning which he says that it „is perhaps



af stigmata forbyder, medens beskrivelsen lettere vilde kunne appliceres paa *clavelina nana*, Lahille. De to øvrige arter, en *botrylloides* og en *amaroucium* kan, paa grund af mangelfuld diagnose vanskelig henføres til bestemte arter.

I sit „bidrag til en skildring af den arctiske molluskfauna ved Norges nordlige kyster“ refererer prof. M. Sars kun tidligere i ovennævnte reise i Lofoten og Finmarken omtalte arter.

Mac Andrews og L. Barrett medtager i sin „List of the mollusca observed between Drontheim and the North Cape“ (publ. 1856) følgende 3 synascidier:

*Amaroucium argus*, M.-Edw.

*Botryllus polycyclus*, M.-Edw.

*Botrylloides albicans*, M.-Edw.

*Amaroucium argus* er synonym med *morchellium argus*, M.-Edw., *botryllus polycyclus* med *polycyclus renieri*, Lamarck.

Kükenthal & Weissenborn: Ergebnisse eines zoolog. Ausfl. an die Westküste Norwegens (publ. 1886). Af sammensatte ascidier blev kun 2 arter bestemte:

*Botryllus schlosseri*, Pallas.

*Botryllus albicans*, M.-Edw.,

som begge blev fundne i Bognøstrømmen. *Botryllus albicans*, M.-Edw. er antagelig en trykfeil for *botrylloides albicans*, M.-Edw.

Sidstnævnte 4 arter vil jeg kun medtage med alt forbehold i min fortegnelse, da jeg hverken har haft anledning til at undersøge originaleksemplarerne eller i nogen af vore museer har paatruffet disse arter. Jeg er ogsaa meget tilbøilig til at tro, at ialfald de to førstnævnte, *morchellium argus*, M.-Edw. og *polycyclus renieri*, Lamarck er forvekslede med nærstaaende arter.

Nogen fortegnelse over den udenlandske literatur har jeg fundet det overflødigt at anføre, da en meget fuldstændig saadan findes i prof. W. A. Herdman's „Report of the result of Voyage of Challenger“.

the young of *Clavelina lepadiformis*“, a supposition which the number of stigmata precludes, while the description could more readily be applied to *Clavelina nana*, Lahille. The two other species, a *Botrylloides* and an *Amaroucium*, cannot easily be referred to any definite species, on account of their defective description.

In his „Bidrag til en skildring af den arctiske molluskfauna ved Norges nordlige kyster“, Prof. M. Sars only refers to the above-mentioned species earlier in his journey in Lofoten and Finmark.

MacAndrews and L. Barrett, in their „List of the Mollusca Observed between Drontheim and the North Cape“ (publ. 1856), include the 3 following Synascidiæ:

*Amaroucium argus*, M.-Edw.

*Botryllus polycyclus*, M.-Edw.

*Botrylloides albicans*, M.-Edw.

*Amaroucium argus* is synonymous with *Morchellium argus*, M.-Edw., *Botryllus polycyclus* with *Polycyclus renieri*, Lamarck.

Kükenthal & Weissenborn: Ergebnisse eines zoolog. Ausfl. an die Westküste Norwegens (publ. 1886). Only 2 species of Compound Ascidiæ are determined:

*Botryllus schlosseri*, Pallas.

*Botryllus albicans*, M.-Edw.

both of which were found in Bognøstrømmen. *Botryllus albicans*, M.-Edw., is presumably a misprint for *Botrylloides albicans*, M.-Edw.

The 4 last-named species I only include in my list with every reservation, as I have not had the opportunity of examining the original specimens, nor have I met with these species in either of our museums. I am also inclined to believe that at any rate the first two, *Morchellium argus*, M.-Edw. and *Polycyclus renieri*, Lamarck; have been confounded with nearly-allied species.

I consider it superfluous to give a list of foreign works on this subject, as a most complete one will be found in Prof. W. A. Herdman's „Report on the Sc. Res. of the Voyage of Challenger“.

## Didemnidæ, Giard.

**Didemnoides.** (Drasche 1883). Nov. nom. Lahille 1890.

Drasche skiller mellem „tynde“ og „tykke“ cormi af slægten *Leptoclinum* og bibeholder dette navn for de første, medens han kalder de tykke *didemnoides*, en subdeling analog med *botrylloides* og *sarcobotrylloides*. At benytte tykkelsen som eneste karaktermerke synes her endnu mindre begrundet end ved *botryllidæ*, da forskjellen er endnu mindre udpræget. Lahille derimod anvender dette navn for „*didemnider* uden kalkspicula i tunicaen, og hvis branchialsæk har 3 rækker stigmata“, hvilken sidste navnanvendelse jeg har fulgt, da spiclernes tilstedeværelse eller fraværelse i tunicaen frembyder en langt constantere karakter.

### ***Didemnoides variabile*, n. sp.**

(Tab. I, fig. 1, 2).

Kolonierne danner cylinderformige eller ganske uregelmæssige klumper paa indtil 3 cm. længde og 1 cm. tykkelse incrusterende forskellige alger; sjældnere optræder de som skorpeformige betræk af omtr. 2<sup>mm</sup> tykkelse og indtil 10 cm. længde almindelig over *laminariestilke*.

Farven er lyst graablaa, grøn- eller brunagtig. Det mørke pigment, der betinger koloniens farve, er beliggende kun i den abdominale del af individernes ectoderm og skinner ofte gennem den fælles tunica som mørke punkter. Undertiden mangler det mørke pigment fuldstændig. Tunicaen er transparent, farveløs og oftest fast, undertiden af en blødere gelatinøs konsistens; cellerne er store og blæreformige. Kalkspicler mangler fuldstændig.

Individerne er lysebrune af farve; længden omtr. 2<sup>mm</sup>. De sidder tæt ved hinanden ofte stillede i længere eller kortere rækker.

In- og egestionsaabningens tuber af samme vidde og længde. Den sidste danner en cylinderformig tragt.

## Didemnidæ, Giard.

**Didemnoides.** (Drasche, 1883) Nov. nom. Lahille, 1890.

Drasche distinguishes between „thin“ and „thick“ cormi of the genus *Leptoclinum* and retains that name for the former, calling the thick ones *Didemnoides*, a subdivision analogous to *Botrylloides* and *Sarcobotrylloides*. To employ the thickness as the only character mark, seems to have even less ground here than in the *Botryllidæ*, as the difference is even less marked. Lahille, on the other hand, applies this name to „*Didemnidæ* without calcareous spicules in the tunic, and whose branchial sac has 3 rows of stigmata.“ I have followed the latter nomenclature, as the presence or absence of spicules in the tunic presents a far more constant character.

### ***Didemnoides variabile*, n. sp.**

(Pl. I, figs. 1, 2).

The colonies are in the form of cylindrical or quite irregular lumps up to 3 cm. in length and 1 cm. thick, investing various algæ; they appear less frequently as a crust-like investment about 2<sup>mm</sup> thick and with a maximum length of 10 cm., usually upon *Laminaria* stalks.

The colour is either a light bluish grey, greenish or brownish. The dark pigment that determines the colour of the colony, is only found in the abdominal portion of the ectoderm of the individual animals, and often shows through the common tunic as dark spots. Sometimes the dark pigment is completely wanting. The tunic is transparent, colourless and most frequently firm, though occasionally of a softer, gelatinous consistency; the cells are large and bladder-like. Calcareous spicules are entirely absent.

The members are of a light brown colour, their length being about 2<sup>mm</sup>. They lie close to one another, often arranged in long or short rows.

The siphons of the branchial and atrial orifices are of the same length and breadth. The atrial aperture is in the form of a cylindrical funnel.



Tentakelkransen bestaar af 8 alternerende længere og kortere tentakler.

Branchialsækken med  $2 \times 12$  stigmata i hver af de 3 rækker, der optager hele dennes længde.

Kloakaabningerne er forholdsvis talrige, smaa og runde.

De modne æg og larverne, der næsten er af ventrikulens størrelse, ligger frit og enkeltvis i den fælles tunica, i kolonier af cylinderform samlede mod dennes axe i de skorpeformige cormi nedenfor individerne.

Vas deferens er spiralformig snoet 12 gange rundt testikelen.

Ved koloniernes overflade forekommer meget hyppig ved kloakaabningernes udmunding smaa kugle- eller lindseformige legemer gullvide af farve med en diameter af  $1-3^{mm}$ . Disse er omgivne af en tynd mod overfladen tykkere hinde og er fyldte med en utallig mængde smaa ovale kiselsyreplader ordnede i ovale klumper, der synes at antyde smaa parasiters tilstedeværelse og disses form. Disse optræder meget almindelig hos denne art, sjeldnere har jeg fundet dem hos leptocliner og diplosomer.

*Didemnoidea variabile* forekom almindelig i juni—juli maaned ved Espevær og Bømmeløen i en dybde af 3—6 favne. Paa de samme lokaliteter er den funden af Hjort ogsaa i marts. Ved Andenæs fandt jeg denne art almindelig (juli). I universitetets samling findes eksemplarer samlede af M. Sars ved Hammerfest, Tromsø og Solsvig.

En varietet, som jeg vil benævne *gelatinosa* blev funden i den bohusslänske skjærgaard af Floderus (juli). Denne adskiller sig fra typeformen hovedsagelig ved sin gelatinøse, bløde konsistens og ved individernes tættere og mere uregelmæssige stilling til hinanden. Ligeledes mangler her det abdominale pigment.

*Didemnoidea inarmatum*, Drasche og *d. tortuosum*, Drasche er vistnok begge meget nærstaaende former, af hvilke jeg dog ikke tør identificere nogen med denne, idet disses beskrivelse væsentlig refererer sig blot til farven og andre ydre karakterer.

### **Didemnum, Savigny, 1816.**

**Didemnum roseum, Sars, 1851.**

1851. *Didemnum roseum*, Sars. Nyt Mag. for Nat. Bd. VI.

Sars's kortfattede beskrivelse skal jeg supplere med nedenstaaende tilføielser:

Kolonien danner ialmindelighed tykke skorpeformige betræk eller sjeldnere uregelmæssige klumper paa indtil 1 cm.s tykkelse omvoksende hydroider og alger. Det største eksemplar havde en længste udstrækning af 5.5 cm.

The fringe of tentacles consists of 8 alternately long and short tentacles.

The branchial sac has  $2 \times 12$  stigmata in each of the 3 rows, which occupy its entire length.

The cloacal apertures are small and round, and comparatively numerous.

The mature ova, and the larvæ, which are almost as large as the ventricle, lie free and singly in the common tunic, in the cylindrical colonies congregated towards the axis in the crust-like cormi, below the members.

The vas deferens is spiral, winding 12 times round the testicle.

On the upper surface of the colonies, at the mouth of the cloacal apertures, small spherical or lentiform bodies of a yellowish white colour, and with a diameter of from 1 to  $3^{mm}$ , are of very frequent occurrence. They are surrounded by a thin membrane increasing in thickness towards the upper surface, and are filled with innumerable small, oval, silicic acid plates, arranged in oval masses which seem to indicate the presence and form of small parasites. They are of very general occurrence in this species, while I have less frequently found them in *Leptoclinum* and *Diplosoma*.

*Didemnoidea variabile* was commonly found in June and July off Espevær and Bømmeløen, at depths of from 3 to 6 fathoms. Dr. Hjort has also found them in the same localities in March, while I have found the species to be common at Andenæs in July. In the University collection there are specimens collected by Prof. M. Sars at Hammerfest, Tromsø and Solsvig.

One variety, which I will call *gelatinosa*, was found on the Bohuslän belt of rocks by Floderus in July. This is distinguished from the type-forms principally by its gelatinous, soft consistency, and by the closer and more irregular arrangement of the individual members in relation to one another. The abdominal pigment is likewise absent here.

*Didemnoidea inarmatum*, Drasche and *D. tortuosum*, Drasche are without doubt very nearly-allied forms, but I will not venture to identify either of them with the type-form, as their description has reference chiefly to colour and other external characters.

### **Didemnum, Savigny, 1816.**

**Didemnum roseum, Sars, 1851.**

1851. *Didemnum roseum*, Sars. Nyt Mag. for Nat. Bd. VI.

I will supplement Sars's brief account with the following remarks:

The colonies generally form a thick crust-like covering, but sometimes, though less frequently, irregular lumps to the thickness of 1 cm. investing hydroidæ and algæ. The extent of the largest specimens was 5.5 cm.

Farven er mørk rosenrød; individerne viser sig ved koloniens gjennemskjæring kraftig hoirode.

De særdeles tætsiddende, talrige, stjerneformige kalkspicler gjør tunicaen ganske ugjennemsigtig. Hver spicel med talrige, korte, udstaaende pigge (omkr. 50 hos de største).

Individernes længde omtr.  $2^{mm}$ .

Branchialsækkens stigmarækker optager hele dennes længde.

Vas deferens løber i 6 spiralsnoinger om testikelen.

En lang baand- eller tungeformig, horizontaltløbende ectodermforlængelse ved egestionsaabningens udlob.

Denne art fandt jeg i nogle faa cormi i Saltenstrømmen og ved Hasvik (Sorøen) (omkr. 10 favnes dyb). Prof. M. Sars anfører den som ikke sjelden ved Tromsø, Hammerfest og Havøsund.

### **Leptoclinum**, Milne-Edwards, 1842.

#### **Leptoclinum candidum**, Savigny, 1816.

1816. *Leptoclinum candidum*, Savigny. Mém. sur les animaux sans vertèb. pt. II, fasc. I.  
 1872. *Eucoelium parasiticum*, Giard. Recherches sur les Asc. comp. ou Synasc. Ach. Zool. exper. t. I.  
 1877. *Leptoclinum candidum*, Della Valle. Contrib. alla storia nat. dell. Asc. comp. del Golfo di Napoli.  
 1890. — — Lahille. Recherches sur les tuniciers des cotes de France, pg. 92.

En eneste 1 cm.<sup>2</sup> stor, indtil  $2^{mm}$  tyk koloni, fandt jeg ved Espevær, hvorfra den medbragtes tilfældig sammen med nogle andre synascidier og hvor arten sandsynligvis var bleven overseet. Kolonien var fæstet til en alge. Den fælles tunica indeholdt i stort antal de karakteristiske mangestraalede kalkspicler. Kolonien blev funden i juli maaned i en dybde af 4 favne.

### **Diplosoma**, Macdonald, 1858.

Denne slægts mange nærstaaende former blev oprindeligt opstillede som ligesaa mange arter (Giard, Drasche o. fl.). Ved sine omhyggelige undersøgelser har Lahille paavist, at forskjellen i de aller fleste tilfælde kun beroede paa farven. Han har søgt at henføre disse farvevarieteter til 2 typer, som han foreløbig betragter som 2 arter:

*Diplosoma listeri*, Lister. *Diplosoma spongiforme*, Giard, til hvilke ogsaa de norske former lader sig henføre. De

The colour is a dark rose-red, and on cutting through the colony, the members appear of a bright red colour.

The numerous, densely-crowded, stellate calcareous spicules render the tunic quite opaque. Each spicule has numerous short protruding spikes (about 50 in the largest).

The length of the members is about  $2^{mm}$ .

The rows of stigmata in the branchial sac occupy its entire length.

The vas deferens winds in 6 spiral coils round the testicle.

The horizontally-running extension of the ectoderm at the mouth of the atrial orifice, has the form of a long hand or tongue.

I found a few cormi of this species in Saltenstrømmen and at Hasvik (Sorøen) at a depth of about 10 fathoms. Prof. M. Sars notes it as not uncommon at Tromsø, Hammerfest and Havøsund.

### **Leptoclinum**, Milne-Edwards, 1842.

#### **Leptoclinum candidum**, Savigny, 1816.

1816. *Leptoclinum candidum*, Savigny. Mém. sur les animaux sans vertèb. pt. II, fasc. I.  
 1872. *Eucoelium parasiticum*, Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.  
 1877. *Leptoclinum candidum*, Della Valle. Contrib. alla storia nat. delle Asc. comp. del golfo di Napoli.  
 1890. — — Lahille. Recherches sur les tuniciers des cotes de France, p. 92.

I found a single colony, 1 cm. square and  $2^{mm}$  thick at Espevær, whence it chanced to be taken together with some other Synascidiæ, and where the species had probably been overlooked. The colony was attached to sea-weed. The common tunic contained characteristic multi-radiate calcareous spicules in great numbers. The colony was found in July at a depth of 4 fathoms.

### **Diplosoma**, Macdonald, 1858.

The numerous nearly-allied forms of this genus were formerly classed as so many species (Giard, Drasche, etc.). Lahille, by his careful investigations, has proved that the difference, in by far the greater number of cases, was only due to the colour. He has endeavoured to refer these colour-varieties to 2 types, which he temporarily considers as 2 species, viz. *Diplosoma listeri*, Lister, and *D. spongiforme*, Giard, to which the Norwegian forms may also be



kan forholdsvis let adskilles ved tilstedeværelsen eller mangelen paa pigment i tunicaen. Den første pigmentfrie form danner altid ganske tynde flade cormi, medens den anden ofte er læbet eller klumpet. Hvorvidt selv disse er distinkte arter er vel tvilsomt, da ingen constant forskjel kan paavises i individernes anatomiske bygning. Tidligere opstillede karakterer som ingestionsaabningens [mangel paa tænder, tentaklernes forskellige antal og andre afvigelser har vist sig at bero paa usiagtige undersøgelser eller endog sammenblanding med arter af andre genera. Jeg slutter mig derfor til Lahilles udredning af denne genus.

De norske diplosomer repræsenterer begge de ovenfor anførte arter og af *d. spongiforme* 2 farvevarieteter.

#### **Diplosoma listerii.** Lister, 1834 (Lahille, 1890).

1842. *Polyclinum*, Lister. Some Obs. on the Str. and Func. of Tub. and Cell. Pol. and of Asc. Phil. Trans. part. I.

1890. *Diplosoma listeri*, Lahille. Recherches sur les tuniciers des côtes de France. p. 104.

Cormus altid tynd og transparent, saaat branchialstigmata og alle øvrige indre organer er fuldstændig synlige uden nogen særegen præparation:

#### var. **D. gelatinosum-listeri**, Milne-Edwards, 1842.

1842. *Didemnum gelatinosum*, M.-Edw., og

1842. *Leptoclinum gelatinosum*, M.-Edw. Obs. sur les asc. compt. des côtes de la Manche. Mem. acad. sci. t. XVIII.

1862. *Didemnum gelatinosum*, Gegenbaur. Ueber Didemnum gelatinosum. Müller, Archiv p. 149.

1890. *Diplosoma gelatinosum-listeri*, Lahille. Recherches sur les tuniciers des côtes de France, p. 107.

Denne varietet fandt jeg i 2 smaa cormi i juli maaned ved Espevær i en dybde af 5—6 favne fæstet til laminaria sacharina. Af Hjort er der i november indsamlet store kolonier ved Lervik paa Stordøen. I universitets-samlingen findes eksemplarer fra Solsvig ved Bergen.

#### **Diplosoma spongiforme**, Giard, 1872.

1872. *Diplosoma spongiforme*, Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.

1890. — — Lahille. Recherches sur les tuniciers des côtes de France, p. 123.

referred. They are distinguished with comparative ease by the presence or absence of pigment in the tunic. The first, unpigmented form is always in the form of quite thin, flat cormi, while the second is often lobed or in lumps. How far even these may be [distinct species is probably doubtful, as no constant difference can be shown in the anatomical structure of the animals. The characters formerly given, such as the absence of denticles at the branchial orifice, the difference in the number of tentacles and other variations, have proved to be due to inaccurate investigation or even confusion with species of other genera. I therefore hold with Lahille in his interpretation of this genus.

Both the above-named species are represented by Norwegian *Diplosoma*, *D. spongiforme* by 2 varieties of colour.

#### **Diplosoma listerii**, Lister, 1834 (Lahille, 1890).

1842. *Polyclinum*, Lister. Some Obs. on the Str. and Func. of Tub. and Cell. Pol. and of Asc. Phil. Trans. part I.

1890. *Diplosoma listeri*, Lahille. Recherches sur les tuniciers des côtes de France. p. 104.

The cormus is always thin and transparent, so that the branchial stigmata and all the internal organs are perfectly visible without any special preparation.

#### var. **D. gelatinosum-listeri**, Milne-Edwards, 1842.

1842. *Didemnum gelatinosum*, M.-Edw., and

1842. *Leptoclinum gelatinosum*, M.-Edw. Obs. sur les Asc. comp. des côtes de la Manche. Mem. acad. sci. t. XVII.

1862. *Didemnum gelatinosum*, Gegenbaur. Ueber Didemnum gelatinosum. Müller, Archiv p. 149.

1890. *Diplosoma gelatinosum-listeri*, Lahille. Recherches sur les tuniciers des côtes de France. p. 107.

I found 2 small cormi of this variety in July at Espevær, at a depth of 5 or 6 fathoms, attached to Laminaria saccharina. Large colonies have been found by Dr. Hjort in the month of November at Lervik on Stordøen. In the University collection there are specimens from Solsvig near Bergen.

#### **Diplosoma spongiforme**, Giard, 1872.

1872. *Diplosoma spongiforme*, Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.

1890. — — Lahille. Recherches sur les tuniciers des côtes de France. p. 123.

Cormus flad eller læbet mere eller mindre tyk. Individerne ikke eller særdeles lidet synlige gennem tunicaen.

**Diplosoma spongiforme** (typeformen), Giard.

1872. *Astellium spongiforme*, Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.  
1890. *Diplosoma spongiforme* (type), Lahille. Recherches sur les tuniciers des côtes de France, p. 124.

Forekom i smaa cormi paa zostra i Flødevigen ved Arendal (april), Farven graalig. Hjort fandt i november store kraftige kolonier (indtil 20 cm. lange og 1.5 cm. tykke) paa zostra og forskellige alger ved Lervik paa Stordøen og ved Egersund. I universitetets og Bergens museums samlinger findes eksemplarer fra Bergen og Trondhjemsfjorden.

var. **D. carnosum-spongiforme**, Drasche.

1883. *Diplosoma carnosum*, Drasche. Die Synascidien der Bucht von Rovigno. p. 41.  
1890. *Diplosoma carnosum-spongiforme*, Lahille. Recherches sur les tuniciers des côtes de France, p. 125.

Kun en eneste liden cormus fandt jeg i juli maaned ved Espevær; længden 9<sup>mm</sup>, bredden 7<sup>mm</sup> og tykkelsen blot 1.5<sup>mm</sup>. Koloniens farve intens svovelgul. Trods sine ringe dimensioner maa den dog blive at henføre til denne form paa grund af sin farve og pigmentrigdom, der gjorde individerne ganske ugjennemsigtige.

## Distomidæ, Savigny.

**Distoma**, Gaertner, 1774.

**Distoma crystallinum**, Renier, 1804.

1804. *Polycitor crystallinum*, Renier. Prosp. d. Cl. dei Vermi, p. 17.  
1807. — — Renier. Tav. di Classif. Tav. 7.  
1828. — — Renier. Elem. di Zool. P. III, Fasc. 1, Tav. 15.  
1851. *Distomum vitreum*, Sars. Nyt Mag. for Nat. Bd. VI.  
1863. — — Alder. On the Brit. Tun. Ann. Nat. Hist. 3 ser., V. 11, p. 172.  
1877. — — Della Valle. Contrib. al. st. n. d. Asc. comp. del Golfo di Napoli, p. 43.

Den norske Nordhavsexpedition. H. Huitfeldt-Kaas: Synascididæ.

Cormus flat or lobed, and more or less thick. The members not at all, or only very slightly visible through the tunic.

**Diplosoma spongiforme** (type form), Giard.

1872. *Astellium spongiforme*, Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.  
1890. *Diplosoma spongiforme* (type), Lahille. Recherches sur les tuniciers des côtes de France, p. 124.

Found in small cormi on Zostra in Flødevigen near Arendal, in April: of a grayish colour. Dr. Hjort found large, robust colonies (up to 20 cm. in length, and 1.5 cm. in thickness) in November, on Zostra and different seaweeds, at Lervik on Stordøen, and at Egersund. In the collections in the University and the Bergen museums, there are specimens from Bergen and Trondhjem Fjord.

var. **D. carnosum-spongiforme**, Drasche.

1883. *Diplosoma carnosum*, Drasche. Die Synascidien der Bucht von Rovigno. p. 41.  
1890. *Diplosoma carnosum-spongiforme*, Lahille. Recherches sur les tuniciers des côtes de France, p. 125.

I found only one small cormus in July at Espevær; length 9<sup>mm</sup>, breadth 7<sup>mm</sup> and thickness only 1.5<sup>mm</sup>. Colour of the colony an intense sulphur yellow. In spite of its small dimensions, it must be referred to this form, on account of its colour and richness of pigmentation, which made the members quite opaque.

## Distomidæ, Savigny.

**Distoma**, Gaertner, 1774.

**Distoma crystallinum**, Renier, 1804.

1804. *Polycitor crystallinum*, Renier. Prosp. d. Cl. dei Vermi, p. 17.  
1807. — — Renier. Tav. di Classif. Tav. 7.  
1828. — — Renier. Elem. di Zool. P. III, Fasc. 1, Tav. 15.  
1851. *Distomum vitreum*, Sars. Nyt Mag. for Nat. Bd. VI.  
1863. — — Alder. On the Brit. Tun. Ann. Nat. Hist. 3 ser., V. 11, p. 172.  
1877. — — Della Valle. Contrib. alla storia nat. delle Asc. comp. del golfo di Napoli, p. 43.



1883. *Distoma crystallinum*, Drasche. Die Synasc. der  
Bucht von Rovigno.  
1890. — — Lahille. Recherches sur les tuniciers  
des côtes de France, p. 151.

At identificere Sars's originaleksemplarer af *distomum vitreum* fra universitetssamlingen med *d. crystallinum*, Ren. lod sig med det foreliggende materiale ikke med fuld sikkerhed gjøre paa grund af dettes mindre gode conservering, hvorved f. ex. individernes branchialsæk var bleven saa sterkt contraheret, at ikke et eneste stigma lod sig iagttage. De øvrige anatomiske karakterer tyder dog paa, at denne antagelse er rigtig. Drasche holder ogsaa disse for synonymmer („Die Synascidien der Bucht von Rovigno“).

Som supplement til Sars's beskrivelse kan føies:

Cormus hoide omtr. 3 cm., bredde indtil 2 cm.

Den fælles tunica incrusterer overalt smaa sandpartikler dog mest ved koloniens basis.

Denne art er funden i en dybde af 20–60 fayne foruden paa de af Sars anførte lokaliteter ogsaa i Øxfjord, Manger, ved Hitteren og Aalesund.

### **Distaplia**, Della Valle, 1880.

#### **Distaplia clavata**, Sars, 1851.

(Tab. 1, fig. 3).

1851. *Leptoclinum clavatum*, Sars. Nyt Mag. for Nat.  
Bd. VI.

Prof. Sars henfører denne art til slægten *leptoclinum*, idet han dog bemærker, at den ved sin „form afviger fra de andre bekjendte arter af denne slægt, hvilke alle danne overtræk paa andre legemer“. Han er den første der har beskrevet nogen distaplia-art som synascidie.

Hans beskrivelse skal jeg supplere efter undersøgelsen af originaleksemplarerne, der dog ikke tillod nogen særdeles indgaaende examination paa grund af materialets mindre gode conservering.

Cormus (det største exemplar) 6 cm. lang, med en største diameter af 2.5 cm. „Foden“ er altid smalere end „hovedet“; dog er differensen mindst hos de største exemplarer. Den udgjør omtr. koloniens halve længde.

Systemerne talrige, grenede. Individerne stillede i dobbelte rækker som hos botrylloiderne. Ingen fælles kloak-aabning ved koloniens top.

Individernes maximallængde 4<sup>mm</sup>.

Branchialsækken med omtr. 25 stigmata i hver række.

Ventrikelen stor, assymetrisk, hos de største individer mørk pigmenteret.

Æggesækken var hos de undersøgte species lidet fremtrædende og uden æg.

1883. *Distoma crystallinum*, Drasche. Die Synasc. der  
Bucht von Rovigno.  
1890. — — Lahille. Recherches sur les tuniciers  
des côtes de France, p. 151.

It was not possible, with the material at hand, to identify with perfect certainty Sars's original specimens of *Distomum vitreum* in the University collection with *Distoma crystallinum*, Renier, on account of the defective preservation of the former, the branchial sac of the members, for instance, being so greatly contracted, that not a single stigma could be examined. Other anatomical characters, however, would seem to imply that this supposition was correct. Drasche also holds these to be synonymous (Die Synascidien der Bucht von Rovigno).

The following particulars may be added as a supplement to Sars's description:

Height of the cormus about 3 cm., breadth up to 2 cm.

The common tunic is incrustated all over with small particles of sand, particularly at the base of the colony.

This species was found at depths of from 20 to 60 fathoms in Øxfjord, Manger, at Hitteren and Aalesund, besides the localities stated by Sars.

### **Distaplia**, Della Valle, 1880.

#### **Distaplia clavata**, Sars, 1851.

(Pl. I, fig. 3).

1851. *Leptoclinum clavatum*, Sars. Nyt Mag. for Nat.  
Bd. VI.

Prof. Sars refers this species to the genus *Leptoclinum*, remarking, however, that „in form, it differs from the other known species of this genus, which all form an investment on other bodies“. He was the first to describe any species of *Distaplia* as Synascidia.

I shall supplement his description from the results of an examination of the original specimens, which did not, however, permit of any very minute examination, by reason of their somewhat imperfectly preserved condition.

The cormus (the largest specimen) is 6 cm. long, with a maximum diameter of 2.5 cm. The „foot“ is always narrower than the „head“, although the difference is less in the largest specimens; it constitutes about half the length of the colony.

The systems are numerous and ramified, the members being placed in double rows as in Botrylloidae. There is no common cloacal aperture at the top of the colony.

The maximum length of the members is 4<sup>mm</sup>.

The branchial sac has about 25 stigmata in each row.

The ventricle is large, asymmetrical and, in the largest members, darkly pigmented.

The ovisac in the specimens examined was inconspicuous and without ova.

Denne art forekommer meget almindelig ved Hammerfest og Havøsund i en dybde af 30—40 favne.

**Distaplia livida**, Sars, 1851.

1851. *Leptoclinum lividum*, Sars. Nyt Mag. for Nat. Bd. VI.

Ogsaa denne distapliaart blev af prof. Sars henregnet til slægten *leptoclinum*. Til hans meget kortfattede beskrivelse skal jeg foie:

Cornus: tykke, uregelmæssige, læbeformige, bløde skiver med en største udstrækning af 2.5 cm., og en tykkelse af omtr. 7<sup>mm</sup>.

Individernes længde omtr. 4<sup>mm</sup>. De sidder uregelmæssig om hinanden uden at danne mærkbare systemer.

Ingestionsaabningen vid med 6 korte tænder.

Egestionsaabningen med en smal tunge.

Ventrikelen mindre end hos *d. clavata*, noget assymetrisk, glat.

Den fælles tunica indeholdt rette, noget grenede kanaler, der mindede om botryllidernes stolonier.

Denne fælles tunica's og i høiere grad individernes ugjennemsigtighed i forbindelse med mindre god conservering vanskeliggjorde en omhyggelig anatomisk undersøgelse.

Denne art er af Sars funden ved Hammerfest.

**Clavelina**, Savigny, 1816.

**Clavelina lepadiformis**, Müller, 1787.

1787. *Ascidia lepadiformis*, Müller. Zoologia Danica. vol. II, p. 54, tab. LXXIX, fig. 5.

1833. — — Rasch. Reise i 1833 til Nyhellesund, Mandal og Solsvig.

1842. *Clavelina lepadiformis*, M.-Edw. Observ. sur les asc. comp. des côtes de la Manche. Mem. acad. sci. t. XVIII.

1872. — — Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.

1890. — — Lahille. Recherches sur les tuniciers des côtes de France, p. 181.

Forekommer i temmelig stor mængde ved Næsodden i Christianiafjorden i en dybde af 4—5 favne fastheftet til kalkalger og stene i maanederne september til november. Paa denne tid fandtes hverken æg eller unge knopper. I slutningen af mai fandt jeg paa samme lokalitet blot nogle faa forkroblede individer, paa hvilken aarstid arten næsten syntes at være uddød. I universitetssamlingen findes ogsaa exemplarer fra Sulen.

This species occurs very commonly at Hammerfest and Havøsund at a depth of between 30 and 40 fathoms.

**Distaplia livida**, Sars 1851.

1851. *Leptoclinum lividum*, Sars. Nyt Mag. for Nat. Bd. VI.

This species of *Distaplia* was also referred by Prof. Sars to the genus *Leptoclinum*. I will add the following observations to his very brief description:

The cornus is composed of very soft, thick, irregular, lobed lamellæ with a maximum area of 2.5 cm. and a thickness of about 7<sup>mm</sup>.

The members are about 4<sup>mm</sup> in length. They are placed unsymmetrically and without forming distinct systems.

The branchial aperture is wide, with 6 short denticles.

The atrial aperture has a narrow languet.

The ventricle is smaller than in *D. clavata*, unsymmetrical and smooth.

The common tunic contained rectilinear ramified channels, recalling the stolons in *Botryllidæ*.

The opacity of the common tunic, and still more of the members, combined with defective preparation made a careful anatomical examination somewhat difficult.

This species was found by Sars at Hammerfest.

**Clavelina**, Savigny, 1816.

**Clavelina lepadiformis**, Müller, 1787.

1787. *Ascidia lepadiformis*, Müller. Zoologia Danica. Vol. II, p. 54, Pl. LXXIX, fig. 5.

1833. — — Rasch. Reise i 1833 til Nyhellesund, Mandal og Solsvig.

1842. *Clavelina lepadiformis*, M.-Edw. Observ. sur les Asc. comp. des côtes de la Manche. Mem. acad. sci. t. XVIII.

1872. — — Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.

1890. — — Lahille. Recherches sur les tuniciers des côtes de France, p. 181.

This species occurs rather plentifully at Næsodden in the Christiania Fjord, at a depth of 4 or 5 fathoms, attached to calcareous algae and stones, during the months September—November. Neither ova nor young buds were at that time found. At the end of May, I found in the same locality only a few shrivelled specimens, which seemed to prove that at that time of year, the species is almost extinct. In the University collection there are specimens from Sulen.



## Polyclinidæ, Lahille.

**Glossophorum**, Lahille, 1886.

**Glossophorum sabulosum**, Giard, 1872.

(Tab. 1, fig. 4—7).

1872. *Polyclinum sabulosum*, Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.

1890. *Glossophorum sabulosum*, Lahille. Recherches sur les tuniciers des côtes de France. p. 181.

De af mig fundne cormi afviger i enkelte dele fra Giards og Lahilles beskrivelse, væsentlig derved, at de intet eller kun ganske ubetydeligt indeholder af incrusterede sandkorn og skjælfragmenter og blot ved sin basis. De staar derved nærmest en form, der af Lahille omtales som forekommende ved Duhon, og som blot incrusterer sandkorn paa siderne og ved basis. Herfra og til en form uden incrustation er ikke længere sprang end at det tidligere er kjendt hos en og samme art, en variation, der kan afhænge af koloniernes voksesteder. *Aplidium zostericola* optræder saaledes som af Lahille paavist paa lokaliteter, hvor sterk strøm hvirvler sanden omkring, altid med mere eller mindre incrusteret sand, men altid uden denne, hvor den findes fæstet til zostra.

Da koloniernes form, farve, størrelse og ligeledes individernes anatomi i alt væsentligt stemmer med beskrivelsen af *G. sabulosum*, har jeg henført dem til denne art trods den ovenfor nævnte forskjel.

Cormus's diameter indtil 2.5 cm., høiden indtil 2 cm. Formen mere eller mindre globuløs; ganske smaa (unge) cormi undertiden noget kølleformige, især naar flere sidder fæstede sammen ved basis og minder da i form om *amaroucium proliferum*.

Farven skiddengul med lysere ingestionsaabninger.

Hos yngre cormi findes blot et eneste, cirkulært, hos ældre talrige, mindre regelmæssige systemer.

Af individernes anatomi, som jeg har underkastet en omhyggelig undersøgelse, skal jeg blot anføre, hvad jeg har fundet afvigende fra Lahilles beskrivelse.

„Branchialrækkernes antal gaar undertiden op lige til 16.

Oesophagus er hos de fuldt udviklede individer lige nedenfor sin begyndelse forsynet med en kort tapformig, dorsalt liggende udposning (tab. I, fig. 5, u).

Ventrikelen af samme bredde ved cardia som ved pylorus.

Postabdomen: antallet af testes er hos fuldt udviklede individer almindelig 30—40.“

Større æg og larver forekom i juni—juli kun i faa cormi.

Postabdominal knopdannelse iagttoges i flere kolonier ved denne tid.

## Polyclinidæ, Lahille.

**Glossophorum**, Lahille, 1886.

**Glossophorum sabulosum**, Giard, 1872.

(Pl. 1, figs. 4—7).

1872. *Polyclinum sabulosum*, Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.

1890. *Glossophorum sabulosum*, Lahille. Recherches sur les tuniciers des côtes de France, p. 191.

The cormi found by me differ in a few respects from those described by Giard and Lahille, and chiefly in the fact that they are either not at all or only very slightly incrustated with grains of sand and fragments of shell, and that only at the base. They thus most nearly resemble a form mentioned by Lahille as occurring at Duhon, and which is only incrustated with sand on the sides and base. Between this and a form without incrustation, there is no wider a difference than has formerly been known in one and the same species, a variation which may be due to the colony's habitat. *Aplidium zostericola*, when occurring in places where a strong current whirls the sand about, is always, as Lahille has proved, more or less incrustated with sand, but always without it when found attached to Zostra.

As the shape, colour and size of the colonies, and also the anatomy of the members agrees in all essential particulars with the description of *G. sabulosum*, I have referred the form to that species, in spite of the above-named difference.

The diameter of the cormus is up to 2.5 cm., height up to 2 cm., shape more or less globular. Quite small (young) cormi are sometimes rather club-shaped, especially when several are attached together at the base, when they resemble *Amaroucium proliferum* in shape.

The colour is a dull yellow, lighter at the branchial apertures.

In the younger cormi there is only one circular system, in the older ones the systems are numerous and more irregular.

Concerning the anatomy of the members, which I have submitted to a careful examination, I will only relate what I have found differing from Lahille's description.

The number of rows of branchial stigmata sometimes amounts to 16.

The oesophagus in fully-developed members is furnished just below its commencement with a short, dorsally-placed, process-like tubercle. (Pl. I, fig. 5 u).

The ventricle is of the same width at the cardia as at the pylorus.

Post-abdomen. The number of testes in fully developed specimens is generally between 30 and 40.

Large ova and larvæ were found in only a few cormi in June and July.

Post-abdominal gemmation was observed in several colonies at this time.

Denne art forekom temmelig almindelig i juni—juli maaned ved Espevær og Bommeloen i en dybde af 4—8 favne. I Bergens museums samling har jeg ligeledes paa-truffet et enkelt exemplar uden lokalitetsangivelse. I universitetets samling findes nogle faa cormi fra Herlovær (Sars) under navnet *amaroucium gilvum*.

### **Aplidiopsis, Lahille, 1887.**

Lahille opstiller som de vigtigste slægtskarakterer: „Ingen vridning af tarmen. Ventrikelens glat. Postabdomen ustillet.“ Naar undtages ventrikelens dannelse frembyder denne genus større lighed med aplididae end med polyclinidae, hvad navnet ogsaa tyder paa; men da de sidstnævnte aldrig har ventrikelens vægge glatte, men denne altid forsynet med større eller mindre ujævnheder, bliver *aplidiopsis* alligevel at henføre under polyclinidae, selv om det kunde synes ligesaa naturligt at henregne denne til de første som at *atopogaster*, Herdman og *polyclinoides*, Drasche med foldede, ventrikelvægge er stillet ind under polyclinidae.

Blandt de norske synascidier har jeg fundet 2 arter, som jeg vil henregne til denne genus. Disse har indbyrdes flere ydre ligheder f. ex. begge har usædvanlig lang postabdomen, hvorved de afviger fra Lahilles type: *aplidiopsis vitreus*. Ligeledes er begge arters koloniform nogenlunde ens: stor og globuløs; endelig har de begge en fast eller bruskagtig fælles tunica. Forresten er de yderst forskellige, hvad individernes anatomi angaar: ventrikelens form, branchialsækkens dannelse o. s. v. Den ene *aplidiopsis pomum* viser ogsaa tilbøjelighed til at have en stillet postabdomen, idet enkelte individer har dennes øvre del noget indkneben. Maaske vil de ved en mere indgaaende anatomisk examination end den, jeg har haft anledning til at foretage med det middelmaadige materiale, der har staaet mig til tjeneste, kunde give anledning til opstillen af en ny genus. Foreløbig vil jeg henføre begge arter til slægten *aplidiopsis*.

### **Aplidiopsis, Lahille, 1887.**

#### **Aplidiopsis pomum, Sars, 1851.**

(Tab. I, fig. 8—10).

1851. *Amaroucium pomum*, Sars. Nyt Mag. for Nat. Bd. VI.

Som supplement til Sars's beskrivelse skal anføres:

Det største exemplars maal var følgende: diameteren 8 cm., hoiden 7 cm. Cormus incrusteret ialmindelighed smaa sandpartikler jævnt fordelt over det hele. Fra Bohuslän har jeg dog seet cormi ganske uden nogen incrustation.

This species was of very general occurrence in June and July at Espevær and Bommeloen, at a depth of from 4 to 8 fathoms. In the Bergen Museum collection, I have met with a single specimen, of which the locality was not given. In the University collection there are a few cormi from Herlovær (Sars) under the name *Amaroucium gilvum*.

### **Aplidiopsis, Lahille, 1887.**

Lahille gives as the most important generic marks: „No twisting of the intestine. Ventricle smooth. Postabdomen sessile“. With the exception of the formation of the ventricle, the genus bears a greater resemblance to Aplididae than to Polyclinidae, as the name also implies; but as the ventricle in the latter never has smooth, but always more or less uneven walls, *Aplidiopsis* must nevertheless be classed under Polyclinidae, even though it might seem just as natural to refer it to Aplididae, as to place *Atopogaster*, Herdman, and *Polyclinoides*, Drasche, with their folded ventricular walls under Polyclinidae.

Among the Norwegian Synascidians, I have found 2 species which I shall refer to this genus. These have mutually several external points of resemblance, e. g. both have an unusually long post-abdomen, thereby differing from Lahille's type, *Aplidiopsis vitreus*. The shape of the colony in both forms is also somewhat similar, being large and globular. Lastly, they both have a firm or cartilaginous common tunic. In other respects they are extremely dissimilar, as regards the anatomy of the members, the shape of the ventricle, the formation of the branchial sac, etc. One of them, *Aplidiopsis pomum*, shows a disposition towards a stalked post-abdomen, the upper portion in some of the members being somewhat constricted. Perhaps a more thorough anatomical examination than I have been able to make with the indifferent material at my disposal, might occasion the establishment of a new genus. Meanwhile, I shall class both species under the genus *Aplidiopsis*.

### **Aplidiopsis, Lahille, 1887.**

#### **Aplidiopsis pomum, Sars, 1851.**

(Pl. I, figs. 8—10).

1851. *Amaroucium pomum*, Sars. Nyt Mag. for Nat. Bd. VI.

The following particulars are added as a supplement to Sars's description:

The dimensions of the largest specimen are as follows: diameter, 8 cm., height 7 cm. The cormus is usually incrustated with small particles of sand, evenly distributed over the whole surface. I have, however, seen cormi from Bohuslän quite free from incrustation.



Individernes længde indtil 3 cm., hvoraf branchialsækken optager omtr. 4<sup>mm</sup> og abdomen omtr. 4<sup>mm</sup>.

Ingestionsaabningen med 6 smaa tynde tænder.

Egestionsaabningen med en kort tragt, paa hvis mediale side tungen er fæstet.

Branchialsækken, in- og egestionsaabningen er skuffende lig *glossophorum sabulosum*.

Branchialrækkernes antal gaar ned til 13. Antal stigmata inden hver række omtr. 24 paa hver side.

Dorsallamina af stigmas halve—hele længde.

Ventrikelen er pæreformig, verticaltstillet med den spidse ende vendende nedad.

Postabdomen meget lang; den øvre halve del ialmindelighed transparent og undertiden sammenklemt til sin halve bredde eller mindre, den nedre del opak.

Larverne ligger ligesom hos *glossophorum sabulosum* ordnede paa branchialsækkens sider baade ovenfor og nedenfor anus.

Denne art forekommer sjelden og i en dybde af 20—40 fadne ved Lofoten og Havosund (Sars). Ligeledes har jeg haft anledning til at undersøge eksemplarer fra Bohuslän indsamlede af Floderus.

#### **Aplidiopsis sarsii, n. sp.**

(Tab. I, fig. 11—13).

Cornus globulos, bruskagtig, opak (hos alkoholpræparater) med eller uden en kort fod. Høiden 3.5 cm., diameteren 2.5 cm. Hos et andet eksemplar var høiden 3 cm., diameteren 5 cm.

Individerne omtr. 2 cm. lange, bredden omtr. 1.5<sup>mm</sup>. De ligger tæt ved hinanden med de lange postabdominer bugtede uregelmæssig om hinanden.

Systemer umerkelige.

Ingestionsaabningen med 6 korte tænder.

Egestionsaabningen med en vid tragt, der paa den mediale side forlænger sig til en bred tunge.

Nervegangliet danner udvendig en liden forhøining.

Branchialsækken af smaa dimensioner; længden lig abdomens. Stigmata lod sig ikke tælle paa grund af branchialsækkens contraherede tilstand. Antal rækker var omtr. 14.

Ventrikelen globulos med fuldstændig glatte vægge.

Anus ved branchialsækkens midte.

Postabdomen meget lang indtil 1.5 cm., bugtet i forskellige retninger, cylinderformet, opak (hos alkoholpræparater).

Æggene var usædvanlig store og naaede næsten ventrikelens størrelse. De var alle af samme størrelse og laa i en sækformig udvidelse af postabdomens øverste del.

The length of the members is up to 3 cm. of which the branchial sac and the abdomen each occupy about 4<sup>mm</sup>.

The branchial orifice has 6 small, thin denticles.

The atrial orifice has a short funnel, on the medial side of which the languet is attached.

The branchial sac and the branchial and atrial orifices are strikingly like those parts in *Glossophorum sabulosum*.

The number of rows of branchial stigmata may be as low as 13; the number of stigmata in each row about 24 on each side.

The dorsal laminae measure in length from the half to the whole length of a stigma.

The ventricle is pyriform, placed vertically with the pointed end downwards.

The post-abdomen is very long; the upper half is usually transparent, and sometimes compressed to half its width or less: the lower half is opaque.

The larvæ are arranged, as in *Glossophorum sabulosum*, on the sides of the branchial sac both above and below the anus.

This species is of rare occurrence. It was found, at depths of from 20 to 40 fathoms, at Lofoten and Havosund (Sars). I have also had an opportunity of examining specimens from Bohuslän, collected by Floderus.

#### **Aplidiopsis sarsii, n. sp.**

(Pl. I, figs. 11—13).

The cornus is globular, cartilaginous and opaque (in spirit specimens), either with or without a short peduncle. Height 3.5 cm., diameter 2.5 cm. In one specimen the height was 3 cm., diameter 5 cm.

The members are about 2 cm. long and 1.5<sup>mm</sup> broad. They lie close to one another with their long post-abdomens curved irregularly about one another.

The systems are not noticeable.

The branchial aperture has 6 short denticles.

The atrial aperture has a wide funnel, which elongates itself on the median side into a broad tongue.

The nerve-ganglion forms a little prominence externally.

The branchial sac is of small dimensions, the length being that of the abdomen. The stigmata did not allow of being counted, on account of the contracted state of the branchial sac. The number of rows was about 14.

The ventricle is globular, with perfectly smooth walls.

The anus is in the middle of the branchial sac.

The post-abdomen is very long, up to 1.5 cm., curved in several directions, cylindrical and opaque (in spirit specimens).

The ova are unusually large, almost attaining to the size of the ventricle. They are all of the same size, and lie in a sac-like expansion of the upper part of the post-abdomen.

Denne art er funden ved Beian og Christiansund af prof. M. Sars, efter hvem jeg har givet den navn. Ligeledes har jeg haft anledning til at undersøge et exemplar fra Bohuslän indsamlet af Floderus.

## Aplididæ, Lahille.

### Aplidium, Savigny, 1816.

Herdman opstiller slægten *psammaplidium*, der indbefatter de aplidiumarter, der incrusterer sand i den fælles tunica, hvilken karakter Lahille ikke anser vægtig nok for dannelsen af en egen genus, da han har fundet arter, der optræder baade med og uden incrusterede sandpartikler (f. ex. *aplidium zostericola*). Jeg har derfor heller ikke villet fastholde denne slægt, hvortil i modsat tilfælde nedenstaaende 2 arter maatte henregnes, da de fundne cormi indeholdt sand og skjælfragmenter.

#### *Aplidium lacteum*, n. sp.

(Tab. II, fig. 14—16).

Cormus danner uregelmæssige klumper, hvoraf de største med en diameter af 2 cm., altid incrusterende en stor mængde sand og skjælparkler ved basis. Farven er lyst melkeblaa, sjældnere graahvid med de hvidagtige individer tydelig gennemskinnende; heraf artsnavnets dannels.

Individerne er indtil 2.5<sup>mm</sup> lange, omtr. 0.3<sup>mm</sup> brede. De ligger uregelmæssig krummede om hinanden uden merkbare systemer.

Ingestionsaabningen med 6 korte tænder. Egestionsaabningen er trukket langt ned og forsynet med 6 rudimentære næsten umerkelige tænder. Ofte ser den rent cirkulær ud.

Nervegangliet viser sig udenfra som en sterkt fremløbende forhøining.

Branchialsækken har omtr. 5 rækker stigmata, hvilke paa grund af dennes sterke kontraktion var yderst vanskelige at tælle.

Ventrikelen med 10—12 langsløbende folder.

Postabdomen indtager omtr. halvdelen af individets hele længde og er i de øverste  $\frac{2}{3}$  fyldt af æg, der ligger regelmæssig ordnede i en enkelt række. 1—2 af de øverste af disse lyst farvede, de øvrige mørke.

Denne art forekom i juli maaned ikke sjelden ved Espevær og Bommelhuk i en dybde af 60—100 favne fæstet til monascidier og skjælfragmenter. I Bergens samling fandtes ligeledes et par smaa cormi; lokalitet: Hakelsund; dybde 100—200 favne.

The species was found at Beian and Christiansund by Prof. M. Sars, after whom I have named it. I have also had an opportunity of examining a specimen from Bohuslän, taken by Floderus.

## Aplididæ, Lahille.

### Aplidium, Savigny, 1816.

Herdman establishes the genus *Psammaplidium*, which includes those species of *Aplidium*, whose common tunic is incrustated with sand. This is a character which Lahille does not consider important enough to warrant the establishing of a special genus, as he has found species both with and without incrusting sand-particles (e. g. *A. zostericola*). I will not therefore retain this genus, under which, on a contrary supposition, the species now following would have to be classed, as the cormi found contained sand and fragments of shell.

#### *Aplidium lacteum*, n. sp.

(Pl. II, figs. 14—16).

The cormi are in the form of irregular lumps, of which the largest have a diameter of 2 cm.; they are always thickly incrustated at the base with sand and shell-particles. The colour is a milky blue, less frequently greyish white with the white members showing distinctly through; hence the name.

The members are up to 2.5<sup>mm</sup> in length, and about 3<sup>mm</sup> broad. They lie irregularly twisted about one another, without forming any perceptible systems.

The branchial orifice has 6 short denticles. The atrial orifice is drawn far down and furnished with 6 almost imperceptible rudimentary denticles. It often appears quite circular.

The nerve-ganglion has the appearance externally of a very forward-projecting prominence.

The branchial sac has about 5 rows of stigmata, which on account of the great contraction of the former, were extremely difficult to count.

The ventricle has from 10 to 12 longitudinal folds.

The post-abdomen constitutes about one half of the entire length of the member, its upper  $\frac{2}{3}$  being filled with ova, which are regularly arranged in a single row. One or two of the uppermost of these are light-coloured, the others dark.

This species occurred not infrequently during the month of July at Espevær and Bommelhuk, at depths of from 60 to 100 fathoms, attached to Monascidæ and fragments of shell. In Bergen Museum there are two or three small cormi; locality, Hakelsund; depth, 100 to 200 fathoms.



**Aplidium flavum, n. sp.**

Cormus liden, kileformig tilspidset nedad med en længde af indtil 2 cm. og en bredde af indtil 1 cm. Kolonierne levede paa kalkalger og døde skjæl, med sin nedre del indklemt i sprækker eller trange aabninger, hvorved formen blev meget uregelmæssig. Kalkpartikler og skjælfragmenter incrusteredes altid især ved basis.

Den fælles tunica transparent, farveløs med de gulbrune individer skinnende igjennem.

Individernes længde indtil 4<sup>mm</sup>, bredde omtr. 0.5<sup>mm</sup>.

Ingestionsaabningen med 6 korte tænder.

Branchialsækken var saa stærkt contraheret at stig-mata og antal rækker ikke lod sig sikkert tælle. Disse lod til at være omtr. 12.

Ventrikelen med 8 longitudinelle folder.

Postabdomen udgjør omtr. individets halve længde med faa store i en enkelt rad liggende æg.

Denne art fandt jeg meget alm. i juli maaned ved Gjesvær i en dybde af 20—35 favne.

**Amaroucium, Milne-Edwards, 1842.****Amaroucium proliferum, M.-Edw., 1842**

1842. *Amaroucium proliferum*, M.-Edw. Observ. sur les Asc. comp. des côtes de la Manche. Mem. acad. sci. t. XVIII.

1877. *Amaroucium roseum*, Della Valle. Contribuz. alla storia nat. delle Asc. comp. del golfo di Napoli.

1890. *Amaroucium proliferum* (typef.), Lahille. Recherches sur les tuniciers des côtes de France, p. 222.

Forekom i kølledannede, ofte drueklaseformige cormi, hvoraf hver enkelt kolle havde en diameter af 3—20<sup>mm</sup>. De fundne cormi repræsenterede typeformen: „individerne med 10—12 branchialstigmata, den fælles tunica pomerantsgul med de gennemskinnende individers branchialsække hoirode“. I juni—juli maaned var postabdomen i næsten alle cormi fulde af store brunviolette æg. Meget sjelden forekom ved denne tid knopper i de tidligere stadier.

Cormi med afvigende farvetegninger blev undertiden paatrufne: ensfarvet skiddengule; undertiden var individernes øvre af kolonien noget fremstikkende del hvidagtig.

Denne art fandt jeg almindelig ved Espevær i en dybde af 4—8 favne. Kolonierne var hyppigst fæstede til hydroider og laminariestilke.

**Aplidium flavum, n. sp.**

The cormus is small, wedge-shaped, pointed below, with a maximum length of 2 cm. and a breadth of 1 cm. The colonies were living on calcareous algæ and dead shells, with their lower portions squeezed into cracks or narrow openings, whereby the shape had become very irregular. They were always incrustated with calcareous particles and fragments of shell, especially at the base.

The common tunic is colourless and transparent, with the yellowish brown members showing through.

The maximum length of the members is 4<sup>mm</sup>, breadth about 0.5<sup>mm</sup>.

The branchial aperture has 6 short denticles.

The branchial sac was so greatly contracted that it was impossible to count the stigmata or the number of rows with any certainty. The latter appeared to be about 12.

The ventricle has 8 longitudinal folds.

The post-abdomen constitutes about half the length of the member, and contains a few large ova in a single row.

I found this species very common during July at Gjesvær, at depths of from 20 to 35 fathoms.

**Amaroucium, Milne-Edwards, 1842.****Amaroucium proliferum, M.-Edw., 1842.**

1842. *Amaroucium proliferum*, M.-Edw. Observ. sur les Asc. comp. des côtes de la Manche. Mem. acad. sci. t. XVIII.

1877. *Amaroucium roseum*, Della Valle. Contribuz. alla storia nat. delle Asc. comp. del golfo di Napoli.

1890. *Amaroucium proliferum* (type), Lahille. Recherches sur les tuniciers des côtes de France, p. 222.

Occurred in club-shaped often botryoidal cormi, in which the diameter of the various lumps measured from 2 to 20<sup>mm</sup>. The cormi found were representatives of the type-form, „the members having from 10 to 12 branchial stigmata, the common tunic being of an orange yellow colour, with the bright red branchial sacs of the members showing through“. In June and July the post-abdomen in nearly all the cormi, was full of large, brownish purple eggs. Buds in the earlier stages very seldom occurred at this time.

Cormi of different colours were sometimes met with, e. g. a uniform dull yellow; and sometimes the upper part of the members, which projected somewhat from the surface of the colony, was whitish.

I found this species common at Espevær at depths of from 4 to 8 fathoms. The colonies were most frequently attached to hydroidæ and Laminaria stalks.

I Bergens museums samling forekom nogle mindre cormi af denne art uden lokalitetsangivelse. I universitetets samling exemplarer fra Herløvær (M. Sars).

**Amaroucium mutabile, Sars, 1851.**

(Tab. II, fig. 17—19).

1851. *Amaroucium mutabile*, Sars. Nyt Mag. for Nat. Bd. VI.

Til Sars's beskrivelse af denne art skal jeg gjøre nogle tilføjelser og rettelser:

Af de i universitetets samling af Sars indsamlede type-exemplarer har et følgende dimensioner: diameteren 5 cm., høiden 3.5 cm.; et andet maaler 2 cm. i diameter og 5.5 cm. i høide. Cormus med eller uden en kort fod, incrusterer fine sandkorn hovedsagelig ved basis.

Systemernes form minder meget om botryllidernes: cirkulære, elliptiske eller uregelmæssig grenede.

Individernes længde omtr. 2.5 cm., bredden omtr. 1<sup>mm</sup>. Branchialsækken og abdomen hver omtr. 4<sup>mm</sup> og postabdomen 3—4 gange saa lang som den øvrige del af individet.

Ingestionsaabningen med 6 tænder.

Branchialsækken med omtr. 7 rækker stigmata. Disse er meget regelmæssige og forekommer i et antal af omtr. 16 i hver række.

Ventrikelen med 4 meget regelmæssige longitudinelle folder og ikke som i Sars's beskrivelse: „ventriculo globoso“.

Postabdomens øvre trediedel noget udvidet og fuld af smaa ligestore æg.

Denne art er af Sars funden ved Hammerfest.

**Parascidium, Milne-Edwards, 1840.**

Syn. *Fragarium*, Giard.

*Fragaroides*, Maurice.

*Parascidia*, Herdman.

*Parascidium*, Lahille.

**Parascidium crispum, n. sp.**

(Tab. II, fig. 20—22).

Cormus uden fod, kurvdannet, noget fladtrykt ovenfra, transparent, meget blød af konsistens. Diameteren indtil 2 cm., høiden indtil 9<sup>mm</sup>. Den fælles tunica pomerantsgul. De gjennemskinnende individer mere eller mindre sterkt hoirode.

Systemerne faa og uregelmæssige.

Individernes længde er indtil 7<sup>mm</sup> og bredden omtr. 0.5<sup>mm</sup>.

Ingestionsaabningens 8 tænder er afstumpede og hver enkelt delt i 3 sjældnere 5 afrundede flige, hvilket giver det krusede udseende, hvortil navnet *crispum* refererer sig.

Den norske Nordhavsexpedition. H. Huitfeldt-Kaas: Synascidiæ.

In the Bergen Museum there are a few small cormi of this species with no locality given; the specimens in the University collection are from Herløvær (M. Sars).

**Amaroucium mutabile, Sars, 1851.**

(Pl. II, figs. 17—19).

1851. *Amaroucium mutabile*, Sars. Nyt Mag. for Nat. Bd. VI.

I will make a few additions to, and corrections of Sars's description.

One of Sars's type specimens in the University collection has the following dimensions: diameter 5 cm., height 3.5 cm.; another measures 2 cm. in diameter, and 5.5 cm. in height. Cormus with or without a short foot; incrustated with fine grains of sand, principally at the base.

The shape of the systems somewhat resembles that of Botryllidæ, being circular, elliptical or irregularly ramified.

The length of the members is about 2.5 cm., the breadth about 1<sup>mm</sup>. The branchial sac and the abdomen are each about 4<sup>mm</sup> in length, and the post-abdomen is 3 or 4 times as long as the rest of the member.

The branchial orifice has 6 denticles.

The branchial sac has about 7 rows of stigmata. These are very regular, and each contain about 16 stigmata.

The ventricle has 4 very regular longitudinal folds, and is not, as Sars describes it, „ventriculo globoso“.

The uppermost third of the post-abdomen is somewhat expanded, and full of small uniformly-sized ova.

This species was found by Sars at Hammerfest.

**Parascidium, Milne-Edwards, 1840.**

Syn. *Fragarium*, Giard.

*Fragaroides*, Maurice.

*Parascidia*, Herdman.

*Parascidium*, Lahille.

**Parascidium crispum, n. sp.**

(Pl. II, figs. 20—22).

The cormus is without a foot, is cultrate, somewhat depressed from the top, transparent and of a very soft consistency. Diameter up to 2 cm., height up to 9<sup>mm</sup>. The common tunic is of an orange yellow colour, the members showing through a more or less bright red.

The systems are few and irregular.

The maximum length of the members is 7<sup>mm</sup> and the breadth about 5<sup>mm</sup>.

The 8 denticles of the branchial orifice are blunt, each one being divided into 3 (more rarely 5) rounded lobes, which impart to it the wavy appearance to which the name *crispum* has reference.



Egestionsaabningen er forsynet med en lang ved basis bred, fra midten af pludselig afsmalnende tunge, der ofte viser en pilformig dannelse med mere eller mindre tydelig fremtrædende tværrynker.

Branchialsækken har 7—8 rækker stigmata, indtil 24 i hver række. De forholdsvis smale stigmata aftager i længde mod ingestionsaabningen. Ligeledes er de 2—4 nærmest endostylen liggende stigmata aftagende i længde mod denne, det sidste ialmindelighed cirkelrunt.

Dorsallamina omtr. af stigmas længde.

Ventrikelen med mange større og mindre, uregelmæssige, longitudinelt udtrukne forhøjninger: „pseudoareole“. Ventrikelen dannelse viser stor variation selv inden samme cornus. Snart bestaar den hovedsagelig af folder, der indtager hele ventrikelen længde, snart udelukkende af korte smaa forhøjninger, ligesom alle overgange forekommer.

Rectum er vid og afsluttes lidt ovenfor branchialsækkens midte.

Postabdomen er noget kortere end den øvrige del af legemet og indkneben mod midten. I de undersøgte corni forekom kun i dennes øverste del enkelte smaa æg.

De faatallige fælles kloakaabninger ender i 2<sup>mm</sup> lange, cylinderformige tuber.

Af de 3 fundne corni var de 2 forsynede med lange postabdominale udløbere, udgaende fra koloniens basis og følgende de laminarieblades ujævnheder, hvortil denne var fæstet. De fleste af disse udløbere viste tidlige stadier af postabdominal knopdannelse.

Denne nye art fandt jeg i juli maaned ved Espevær i blot 3 corni, hvoraf den største svarede til de ovenfor anførte maal. Farven var skuffende lig *amaroucium proliferum*'s, der forekom almindelig paa samme lokalitet.

I universitetets samling findes eksemplarer fra Herløvær, Manger (M. Sars), bestemte som *amaroucium rubicundum*, Frey & Leuck.

*Parascidium crispum* adskilles fra de 3 ved de franske kyster forekommende arter let ved sit ringe antal stigmarækker i branchialsækken: nemlig blot 7—8; herved danner den en naturlig overgang til den nærstaaende genus *circinalium*, der netop har dette antal. Fra alle tidligere kjendte parascidier afviger den ligeledes ved sin mere eller mindre tydelige 3-delning af ingestionsaabningens tænder.

### Synoicum, Phipps, 1774.

Syn. *Sidnyum*, Herdman (ikke Savigny).

*Morchellium*, Herdman (ikke Lahille).

**Synoicum incrustatum**, Sars, 1851.

(Tab. II, fig. 23—25).

1851. *Amaroucium incrustatum*, Sars. Nyt Mag. for Nat. Bd. VI.

The atrial orifice is furnished with a long tongue, broad at the base, and abruptly tapering from the middle; it often exhibits a sagittal formation, and more or less distinctly prominent transverse folds.

The branchial sac has 7 or 8 rows of stigmata with as many as 24 stigmata in each row. These are comparatively narrow, and decrease in length towards the branchial aperture. The 3 or 4 nearest to the endostyle also decrease in length as they approach it, the last being generally circular.

The dorsal lamina is about the length of a stigma.

The ventricle has numerous irregular, longitudinally elongated prominences of various sizes, the „pseudo-areolæ“. The formation of the ventricle exhibits great variations, even in the same cornus. Sometimes it consists principally of folds occupying its whole length, sometimes exclusively of small prominences such as occur in all transitions.

The rectum is wide, and ends a little above the middle of the branchial sac.

The post-abdomen is rather shorter than the rest of the body, and constricted towards the middle. Small ova were found only in its upper part in the corni examined.

The few common cloacal apertures end in cylindrical tubes 2<sup>mm</sup> in length.

Two of the three corni found were furnished with long post-abdominal stolons starting from the base of the colony and following the unevennesses of the *Laminaria* leaf to which the colony was attached. Most of these off-shoots showed early stages of post-abdominal gemmation.

I found only 3 corni of this new species at Espevær in July. The largest of the three corresponded with the above-given measurements. The colour was strikingly like that of *Amaroucium proliferum*, which generally occurred in the same locality.

In the University collection there are specimens from Herløvær, Manger (M. Sars), labelled *Amaroucium rubicundum*, Frey and Leuck.

*Parascidium crispum* is easily distinguished from the 3 species occurring on the French coasts, by the small number of rows of stigmata in the branchial sac, viz. only 7 or 8. It thus forms a natural transition to the nearly-allied genus, *Circinalium*, which has precisely this number. It also differs from all previously known *Parascidia* by the more or less distinct triple division of the denticles of the branchial orifice.

### Synoicum, Phipps, 1774.

Syn. *Sidnyum*, Herdman (not Savigny).

*Morchellium*, Herdman (not Lahille).

**Synoicum incrustatum**, Sars, 1851.

(Pl. II, figs. 23—25).

1851. *Amaroucium incrustatum*, Sars. Nyt Mag. for Nat. Bd. VI.

Som supplement til Sars beskrivelse skal jeg anføre:

Cormus incrusterer en mængde smaa sandpartikler især ved overfladen. Kolonien smalner af mod sin basis, den er undertiden ved fordybninger paa oversiden afdeelt i flere adskilte klumper, der hver repræsenterer et system. Høiden indtil 2 cm., diameteren ligeledes indtil 2 cm.

Individernes længde omtr. 9<sup>mm</sup>, bredden omtr. 1.5<sup>mm</sup>.

Ingestionsaabningen med 6 tænder.

Egestionsaabningen forsynet med en kort analtunge.

Branchialsækken, der udgjør halvdelen af hele individets længde, har alm. 12 stigmarækker med omtr. 18 meget regelmæssige stigmata i hver.

Dorsallamina af stigmas længde.

Ventrikelens overflade med en utallig mængde smaa halvkugleformige forhøjninger („areole“). Dens form er globuløs, ubetydelig højere end bred.

Anus udmunder omtr. i højde med 5te branchialrække ovenfra.

Postabdomen kort og bred omtr. af branchialsækkens længde og opfyldt af tæt sammenpakkede større og mindre æg.

Denne art er funden temmelig alm. i Lofoten (Sars) paa 20 farnes dyb.

## Botryllidæ.

Denne fra de øvrige synascidier skarpt afgrænsede familie, omfatter en mængde yderst variable og lidet distinkte arter og farvevarieteter. Giard anfører saaledes ikke mindre end 38 botryllus- og botrylloidesformer fra en enkelt lokalitet paa den franske kyst. Lahille tror at kunne fordoble dette tal, men vil ikke opstille nye former blot støttede paa pigmentets anbringelse og individernes relative dimensioner. Medens denne forfatter fremhæver, „at ingen karakter hos denne familie er mere variabel end pigmentationen“, anser Giard denne for „maaske at give den bedste støtte ved classificationen“, samtidig med at han dog raaber et varsko: „nimium ne crede colori“. Begge anbefaler undersøgelser af de levende dyr fortsatte gennem længere tid. Lahille tillige kunstig hybridation.

Da jeg selv har haft anledning til at studere en art: *botryllus violaceus*, (?) M.-Edw. gennem længere tid baade i aquarium og paa dens oprindelige levested, skal jeg nedenfor anføre nogle af mine iagttagelser angaaende denne arts farvevariationer, koloniernes og systemernes form, udvikling o. s. v.

Man ser ofte en botryllus-arts systemform beskrevet udelukkende som cirkulær en andens som udelukkende elliptisk. Dettets form beror vistnok i de aller fleste tilfælde

As a supplement to Sars's description, I will add the following remarks:

The cormus is incrusted with numbers of little particles of sand, especially on the upper surface. The colony becomes narrower towards the base. It is sometimes divided, by depressions on the upper side, into several distinct lumps, each representing a system. The maximum height is 2 cm., the diameter the same.

The length of the members is about 9<sup>mm</sup>, breadth about 1.5<sup>mm</sup>.

The branchial orifice has 6 denticles.

The atrial orifice is furnished with a short anal languet.

The branchial sac, which constitutes half the length of the member, has generally 12 rows of stigmata, with about 18 very regular stigmata in each.

The dorsal lamina is the length of a stigma.

The surface of the ventricle is covered with innumerable small hemispherical papillæ („areolæ“). The ventricle is globular in shape, slightly higher than it is broad.

The opening of the anus is about on a level with the 5th row of branchial stigmata, counting from above.

The post-abdomen is short and broad, of about the same length as the branchial sac, and is filled with closely-packed, large and small ova.

This species was rather common in Lofoten (Sars), at a depth of 20 fathoms.

## Botryllidæ.

This family, which is so distinctly separated from other Synascidæ, includes a number of exceedingly variable and indistinct species and varieties of colour. Giard, for instance, names no fewer than 38 Botryllus and Botrylloides forms from a single locality on the French coast. Lahille is of opinion that he could double this number, but will not establish new forms distinguished only by the mode of pigmentation, and the relative dimensions of the members. While this latter author emphasises the fact that „no character in the family is more variable than the pigmentation“, Giard considers that it „affords perhaps the best guide in classification“, though at the same time, he utters the warning: „nimium ne crede colori“. Both writers recommend examination of the living animal continued for some time, Lahille also artificial hybridisation.

Having had the opportunity of studying one species, *Botryllus violaceus*, (?) M.-Edw., throughout a lengthened period, both in the aquarium and in its native haunts, I will here record some of my observations concerning the varieties of colour, the shape of the colonies and the systems, the development, etc. of the species.

The shape of the systems in one species of Botryllus is often described as invariably circular, of another as invariably elliptical, but the shape doubtless depends in most



paa koloniens alder. Hos *B. violaceus* fandt jeg saaledes om vaaren (april—mai) næsten lutter cirkulære systemer med et ringe antal individer, om høsten (september—november) hovedsagelig elliptiske systemer med indtil 30 individer. Medens der tidlig paa aaret optræder faatallige og ganske smaa cormi, stiger antallet og størrelsen af disse udover sommeren for at kulminere i oktober maaned. Tykkelsen af cormus er hos denne art forholdsvis constant 1—2<sup>mm</sup>, formen forøvrig vekslende, idet den betinges af de algers eller zostrablades form, hvortil den er fæstet. De sidstes langstrakte form frembringer saaledes baandformige cormi. Paa samme maade synes ogsaa systemerne at afpasse sig efter de lokale forhold, idet de samtidig med koloniens vækst strækker sig i bladets længderetning. I det hele og store taget tør man vel gaa ud fra at koloniens alder til en vis grad er proportional med dens størrelse og med antal individer i systemerne.

Farven er hos denne art saa hoist varierende, at man kun med vanskelighed vil kunne finde to absolut ensfarvede cormi. Det blaa pigment er mest udbredt, det gule mindre hyppigt og forekommer væsentlig paa den centrale del af individernes overside som et smalere eller bredere baand. Den grønne farve fremkommer altid ved en blanding af blaat og gult pigment. Den rustbrune farve var ulige sjældnere og mindre udbredt: især omkring in- og egestionsaabningen og ved nervegangliet. Det sidste pigment optraadte især hos sygelige cormi senhostes.

Hvad farvernes relation til aarstiden angaar, vil jeg anføre, at det blaa pigment optræder rigeligst om vaaren, medens det gule er karakteristisk for høstformerne, der ved sin pigmentblanding for det blotte øie giver et grønt eller gulgrønt udseende.

At voksestedet ikke i nogen væsentlig grad betinger farven, vil man se deraf, at de forskjelligste varieteter findes fæstede til samme zostrablad i hinandens umiddelbare nærhed.

Senhostes (december) foregaar der en sterk udskillen af cellulose, som ofte afsættes i smaa klumper paa flere millimeters tykkelse samtidig med individernes gradvise hændoen. Der forekommer ikke sjelden ved denne aarstid større cormi kun opfyldte af stoloner hist og her med enkelte yngre knopper eller systemer af saadanne.

Individernes dimensioner er hos denne art meget vekslende dog forholdsvis ens inden samme koloni. Aarsagen hertil maa vel ialfald delvis antages at ligge i forskjellige ernæringsforholde. Individernes form har jeg idetheletaget fundet at være mere langstrakt og smal i cormi med elliptiske end i dem med cirkulære systemer.

cases on the age of the colony. In *B. violaceus*, for instance, I found in the spring (April and May) almost perfectly circular systems with few members, in the autumn (September to November), principally elliptical systems, with sometimes as many as 30 members. Whereas early in the year the cormi are few and quite small, during the summer their number and size increase, to culminate in October. The thickness of the cormi in this species is comparatively constant, from 1 to 2<sup>mm</sup> while the shape varies, being determined by the shape of the algæ or *Zostra* leaves to which they are attached. In this way the elongated form of the latter produces ribbon-like cormi. In the same way the systems seem to adapt themselves to local conditions; as they extend simultaneously with the growth of the colonies in the direction of the length of the leaf. On the whole, we may venture to assume that the size of the colony and the number of members in its systems, are, to a certain extent, proportional to its age.

The colour in this species is so extremely variable, that it is difficult to find two cormi absolutely uniform in that respect. Blue is the most general colour, yellow less frequent, and occurring for the most part on the central portion of the upper side of the member in the form of a broad or narrow band. Green is always produced by a mixture of blue and yellow. The rusty brown colour was considerably rarer and less diffused, especially round the branchial and atrial apertures and by the nerve-ganglion. The last-named colour appeared especially in sickly cormi, late in the autumn.

With regard to the relation of the colour to the season of the year, I may state that the blue pigment appears plentifully in the spring, while the yellow is characteristic of autumn forms, which with their mixture of pigments have a green or yellowish green appearance to the naked eye.

That the habitat does not to any great extent influence the colour, will be seen from the fact that the most different varieties are found attached to the same *Zostra* leaf, in one another's immediate vicinity.

Late in the autumn (December), a large secretion of cellulose takes place, it being frequently detached in small lumps several millimetres in thickness, simultaneously with the gradual dying away of the members. Large cormi are not infrequently found at this time of year only filled here and there with stolons, with a few young buds or small systems of such.

The dimensions of the members in this species are very variable, though comparatively uniform within each colony. The reason of this must, partly at any rate, be considered due to varied nutritive conditions. I have found the shape of the members, on the whole, to be more elongated and narrow in cormi with elliptical systems than in those with circular systems.

**Botryllidæ** indbefatter de 2 slægter:

**Symplegma**, Herdman, 1886.

**Botryllus**, Goertner, 1774.

Til den første hører blot en eneste art fra Bermudas øerne, beskrevet af Herdman. Den anden slægts farverigdom har opfordret til opstilling af subgenera, hvilke har frembudt store vanskeligheder paa grund af arternes conformitet. Man har derfor foreløbig endog maattet nøie sig med at benytte koloniens tykkelse som karaktermerke: hvad der er over og under  $5^{mm}$ , et maal, der er ganske vilkaarlig valgt. Heller ikke er tykkelsen videre constant. Unge corni af *polycyclus* eller *sarcobotrylloides* er saaledes under det opstillede lavmaal  $5^{mm}$ . Slægtsbestemmelsen kræver derfor undersøgelse af et større antal kolonier og helst til forskellig aarstid, naar man da ikke er saa heldig straks at finde en tyk cornus.

Almindelig opstilles 4 følgende subgenera (Drasche, Herdman, Lahille):

Systemerne hovedsagelig kredsformige el. elliptiske.	<i>Botryllus</i> (Goert.). Tykkelsen af cornus gaar aldrig over $5^{mm}$ .
	<i>Polycyclus</i> (Lam.). Tykkelsen af cornus overstiger altid $5^{mm}$ .
Systemerne hovedsagelig grenede.	<i>Botrylloides</i> (M.-Edw.). Tykkelsen af cornus gaar aldrig over $5^{mm}$ .
	<i>Sarcobotrylloides</i> (Dr.). Tykkelsen af cornus overstiger altid $5^{mm}$ .

Lahille vil kun bibeholde disse slægter som rent provisoriske, idet han venter, at der ved mere omfattende undersøgelser vil fremdukke sikrere anatomiske eller blastogenetiske slægtskarakterer. Han giver et fingerpeg for classificationen ved sin omhyggelige beskrivelse af tentakler og branchialsæk under sin behandling af slægten *polycyclus*. Herdman stiller tentaklernes antal og form i første række ved artsbestemmelsen. Hos de faatallige arter, jeg har haft anledning til at undersøge, har jeg fundet disse 2 karakterer at være de paalideligste. For tentaklernes vedkommende maa man dog forsikre sig om at have fuldt udviklede individer for sig, da man ellers risikerer at finde et for ringe antal. Antal stigmata i branchialsækken er heller ikke fuldt ud constant, idet hos hver art baade antallet af de verticale rækker varierer (f. ex. fra 10—12), ligesom formen for hver af disse igjen er noget vexlende, begge dele endog inden samme cornus. Man finder saaledes hos en art almindeligst f. ex. følgende formel: *d.* (dorsal side) 8—5—5—8 *v.* (ventral side); de 3 streger betegner de 3 paa branchialsækkens indvendige side longitudinelt løbende bjælker (*côtes longitudinales*, Lahille); ved siden heraf forekommer ogsaa formlerne: *d.* 8—4—4—8 *v.* og *d.* 8—5—6—9 *v.* Ved branchialsækkens beskrivelse kan derfor blot anføres grænserne for eller det almindeligst forekommende antal af stigmata. Angaaende grupperne *botryllus* (*polycyclus*) og *botrylloides* (*sarcobotrylloides*) relationer til hinanden med hensyn til branchialsækkens dannelse, saa

The family **Botryllidæ** includes the two genera:

**Symplegma**, Herdman, 1886, and

**Botryllus**, Goertner, 1774.

Only one species, from the Bermudas, and described by Herdman, belongs to the first of these. The wealth of forms in the second genus has called for the establishment of sub-genera, and this has presented great difficulties on account of the conformity of the species. It has therefore been found necessary to employ, for the present, the thickness of the colonies as a characteristic mark, distinguishing between those that are over, and those that are under  $5^{mm}$ , a measurement which is arbitrarily chosen. But neither is the thickness very constant. Young corni of *Polycyclus* or *Sarcobotrylloides*, for instance, are under the given minimum measurement,  $5^{mm}$ . The determination of the genera requires, therefore, the examination of a large number of colonies, and if possible at different seasons of the year, if a thick cornus does not chance to be found immediately.

The four following sub-genera are generally recognized (Drasche, Herdman, Lahille):

Systems chiefly circular or elliptical	<i>Botryllus</i> (Goert.). Thickness of cornus never exceeding $5^{mm}$ .
	<i>Polycyclus</i> (Lam.). Thickness of cornus always exceeding $5^{mm}$ .
Systems chiefly ramified	<i>Botrylloides</i> (M.-Edw.). Thickness of cornus never exceeding $5^{mm}$ .
	<i>Sarcobotrylloides</i> (Dr.). Thickness of cornus always exceeding $5^{mm}$ .

Lahille only retains these genera as quite provisional, expecting that more comprehensive investigation will bring to light more certain anatomical or blastogenetic generic characters. He gives a hint for classification in his careful description of tentacles and branchial sac in treating of the genus *Polycyclus*. Herdman considers the number and form of the tentacles of first importance in the determination of the species. In the few species that I have had the opportunity of examining, I have found these two characters to be the most reliable. As far as the tentacles are concerned, one must be assured of having a fully developed animal to examine, as otherwise there would be a risk of finding too few. Neither is the number of stigmata in the branchial sac perfectly constant, as in each species the number of vertical rows varies (e. g. from 10 to 12) and the formula for each of these again is rather variable even in the same cornus. In one species, for instance, the following formula is found to be the most general: *d* (dorsal side) 8—5—5—8 *v.* (ventral side). The 3 dashes signify the 3 longitudinal bars (*côtes longitudinales*, Lahille) on the branchial sac. Beside this occur the formulæ *d.* 8—4—4—8 *v.* and *d.* 8—5—6—9 *v.* In describing the branchial sac, therefore, only the limits, or the most frequently occurring number of stigmata are here given. With regard to the relative formation of the branchial sac in the groups *Botryllus* (*Polycyclus*) and *Botrylloides* (*Sarcobotrylloides*), I may state that, according to my experience, the number



er efter mine erfaringer antallet af stigmærækker hos den første gennemgaaende lavere end hos den sidste, medens derimod antallet af stigmata inden hver række er højere hos *botryllus* end hos *botrylloides*. Dette er blot en naturlig følge af individernes hos botrylloidesgruppen cylinderformige langstrakte, hos botryllusgruppen kortere og mere sammentrængte bygning.

Ovennævnte 4 subgenera, om hvis berettigelse der kan herske befoiet tvil, vil jeg i mangel af noget bedre indtil videre fastholde af hensyn til botryllusslægstens formrigdom.

Af botryllolider har jeg fundet 6 arter, hvoraf 2 tilhørende slægten *botryllus*, 1 *polycyclus*, 1 *botrylloides* og 2 *sarcobotrylloides*.

### **Botryllus**, Goertner, 1774.

#### **Botryllus marionis** (?), Giard, 1872.

(Tab. II, fig. 26).

1872. *Botryllus marionis*, Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.

Kun en eneste liden koloni: 4 cm. lang, 8<sup>mm</sup> bred og 1—1.5<sup>mm</sup> tyk, omvoxende en alge. Individernes størrelse og farve svarede i alt væsentlig til Giards beskrivelse; kun var der, istedenfor den paa individernes overside afsatte hvide flæk, 2 noget kortere parallelt løbende streger af samme farve. Med sikkerhed at identificere den fundne art med *b. marionis*, Giard, lader sig dog ikke gjøre, da forfatterens beskrivelse er baseret alene paa farven. Foreløbig vil jeg henføre den fundne cormus til denne art, saa meget mere som denne genus tidligere er overfyldt med nærstaaende ufuldstændig beskrevne arter.

De øvrige artskarakterer er:

Systemerne: circulære eller svagt ellipsformige.

Tentaklerne: 16 i antal, hvoraf de 2 laterale lange og smale; de øvrige ganske korte og af samme længde.

Branchialsækken med 7—8 rækker stigmata. Formlen: *d.* 6—4—4—6 *v.*

Æggene talrige og relativt store.

Arten blev funden i en dybde af 4 favne i Roaldsfjorden ved Bommeloens sydende (juli).

#### **Botryllus violaceus** (?), Milne-Edwards, 1842.

(Tab. II, fig. 27).

1842. *Botryllus violaceus*, M.-Edw. Mem. de l'ac. roy. de sc. tom. XVIII.

1872. — — Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.

of rows of stigmata in the former is, on an average, smaller than in the latter, while on the other hand, the number of stigmata in each row is larger in *Botryllus* than in *Botrylloides*. This is only a natural consequence of the elongated, cylindrical structure of the members in the Botrylloides group, and of the shorter and more compressed structure of those in the Botryllus group.

The above 4 genera, as to whose legitimacy justifiable doubt may prevail, I shall, for want of anything better, retain for the present, on account of the wealth of form in the genus Botryllus.

I have found 6 species of *Botryllidæ*, 2 belonging to the genus *Botryllus*, 1 to *Polycyclus*, 1 to *Botrylloides* and 2 to *Sarcobotrylloides*.

### **Botryllus**, Goertner, 1774.

#### **Botryllus marionis** (?), Giard, 1872.

(Pl. II, fig. 26).

1872. *Botryllus marionis*, Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.

Only one little colony was found, measuring 4 cm. in length, 8<sup>mm</sup> in breadth, and from 1 to 1.5<sup>mm</sup> in thickness, investing sea-weed. The size and colour of the members corresponded in all essential respects with Giard's description, except that instead of the one white spot on the upper side of the member, there are two somewhat shorter parallel streaks of the same colour. It is not however possible to indentify, with any certainty, the species found with *B. marionis*, Giard, as that writer's description is based on the colour alone. For the present I will refer the above cormus to this species, the more readily as this genus was formerly overfilled with nearly-allied, incompletely-described species.

The remaining specific characters are:

Systems circular or slightly elliptical.

Tentacles 16 in number, the 2 lateral ones being long and narrow, the remainder quite short and of equal length.

Branchial sac with 7 or 8 rows of stigmata. Formula, *d.* 6—4—4—6 *v.*

Ova numerous and relatively large.

The species was found in July at a depth of 4 fathoms in Roalds Fjord, at the south end of Bommeloen.

#### **Botryllus violaceus** (?), Milne-Edwards, 1842.

(Pl. II, fig. 27).

1842. *Botryllus violaceus*, M.-Edw. Mem. de l'Ac. roy. de sc. tom. XVIII.

1872. — — Giard. Recherches sur les Asc. comp. ou Synasc. Arch. Zool. exper. t. I.

De fundne cormi svarer med hensyn til farvetegning og øvrige ydre karakterer fuldstændig til Milne-Edwards' og Giard's beskrivelser. Af den sidstøevnte forfatters 6 opstillede varieteter forekom var. *violaceus*, M.-Edw. (typeformen) hyppigst og især om vaaren. Almindelige var ogsaa var. *myosotis*, Giard og var. *diadema*, Giard.

Da disse forfatteres beskrivelse næsten udelukkende refererer sig til farven uden at medtage anatomiske kjendemerker af nogen betydning kan jeg ikke med fuld sikkerhed henføre den af mig fundne art til *b. violaceus*, M.-Edw. trods farvernes fuldstændige overensstemmelse. Nedenfor er anført de vigtigste anatomiske karakterer.

Tykkelsen af cormus er 1—2<sup>mm</sup>, længden indtil 15 cm., bredden lig de zostrablade hvortil de er fæstede. (Se forøvrig beskrivelsen under familj. *Botryllidæ*).

Systemerne cirkulære eller elliptiske med 3—40 individer i hvert.

Individerne varierer i form og størrelse; længden indtil 2<sup>mm</sup>.

Farven er hoist forskjellig. Pigmentet hovedsagelig mørke blaat og lysegult, der i forening frembringer grønne nuancer. Det rødbrune pigment er mindre udbredt.

Branchialsækken med omtr. 7 rækker stigmata, formelen ialm.: *d.* 8—5—5—8 *v.*

Tentaklernes antal 8, hvoraf 2 større laterale, 2 noget kortere dorsalt—ventralt siddende og 4 endnu kortere alternerende med de øvrige.

Denne art forekommer i stor mængde paa zostra og sjældnere paa alger ved Christiania, Næsodden, Drøbak, Hvaløerne og Arendal.

### **Polycyclus, Lamarek, 1815.**

#### **Polycyclus fuscus, n. sp.**

(Tab. II, fig. 28).

Cormus polymorf: uregelmæssig klumpet eller læbet incrusterende alger. Længden indtil 12 cm., tykkelsen indtil 4 cm.; farven lysere eller mørkere graabrun. Individerne er altid mørkere farvede end den fælles tunica. Hvert individ er forsynet med et enkelt smalt, sjældnere dobbelt, radiært (i forhold til systemet) baand, af farve sølvhvidt i alle overgange indtil guldgult. Knopper af de voxne individers halve størrelse har allerede faaet dette baand.

Systemerne er cirkulære eller elliptiske med et antal af 5—30 individer.

Individerne varierer meget i størrelse; længden fra 2—3<sup>mm</sup>; bredden fra 1—1.5<sup>mm</sup>.

Tentaklerne er 4 i antal, hvoraf 2 store veludviklede laterale; de to øvrige dorsalt—ventralsiddende betydelig kortere.

The cormi found answer perfectly, as regards colouring and other external characters, to Milne-Edwards' and Giard's descriptions. Of the six varieties established by the latter writer, var. *violaceus*, M.-Edw. (the type form) occurred most frequently, and especially in the spring. Var. *myosotis*, Giard and var. *diadema*, Giard were also common.

As the description of these authors has almost exclusive reference to colour, without including any anatomical marks that are of any importance, I will not positively refer the species I have found to *B. violaceus*, M.-Edw., notwithstanding the complete correspondence in colour. The most important characters are given below.

The thickness of the cormus is from 1 to 2<sup>mm</sup>, the length up to 15 cm., the breadth similar to that of the Zostra leaf to which it is attached. (See also description under the family *Botryllidæ*).

The systems are circular or elliptical, containing from 3 to 40 members.

The members vary in form and size; their length is up to 2<sup>mm</sup>.

The colour is very varied. Pigment chiefly dark blue and light yellow, which combined produce shades of green. The reddish brown pigment is less widely distributed.

The branchial sac has about 7 rows of stigmata: formula usually *d.* 8—5—5—8 *v.*

The number of the tentacles is 8, of which 2 are large and lateral, 2 rather shorter and respectively dorsal & ventral in position, and 4 still shorter, alternating with the others.

This species occurs in great number on Zostra and less frequently on algæ off Christiania, Næsodden, Drøbak, the Hval Islands and Arendal.

### **Polycyclus, Lamarek, 1815.**

#### **Polycyclus fuscus, n. sp.**

(Pl. II, fig. 28).

Cormus polymorphous, in irregular masses or lobes investing algæ. Length up to 12 cm., thickness up to 4 cm. Colour a light or dark greyish brown: the members are always darker than the common tunic. Each member is supplied with a narrow, single, occasionally double, radiating (in relation to the system) band of any shade of colour between a silvery white and a golden yellow. Buds of half the size of the full-grown members already have this band.

The systems are circular or elliptical, containing from 5 to 30 members.

The members vary greatly in size, their length being from 2 to 3<sup>mm</sup>, breadth from 1 to 1.5<sup>mm</sup>.

The tentacles are 4 in number, 2 large, well-developed lateral ones, the other 2, respectively dorsal & ventral in position, considerably shorter.



Branchialsækken med 10—12 rækker stigmata. Formen almindelig: *d.* 8—5—5—8 *v.*

**Var. *p. inradiatus*** adskiller sig fra typeformen blot ved sin fuldstændige mangel af lyse, radiære baand og ved den fælles tunicas større gjennemsigtighed.

**Var. *p. rufus*** har foruden de 4 ovennævnte tentakler endnu 4 yderst smaa saadanne alternerende med de førstnævnte, men er i sin anatomi forresten aldeles lig typeformen. Individernes farve er rødbrun. Den fælles tunica i levende live transparent. Stolonudvidelserne gulhvide.

Typeformen og var. *p. inradiatus* forekom begge meget almindelig ved Espevær og Bømmeløen (juli maaned), hvor den var den hyppigste synascidie at paatræffe, varieteten sjældnere end typeformen. Begge former fandtes i en dybde af 3—6 favne paa samme lokaliteter, undertiden sammenvoxede til en klump uden at det var mig muligt at paavise overgange mellem dem trods undersøgelsen af over 100 cormi af begge former tilsammen. Typeformen ligner meget i farvetegning *botryllus morio*, Giard og *b. aurolineatus*, Giard. Varieteten *p. rufus* var ikke sjælden ved Andenæs (juli).

### **Botrylloides, Milne-Edwards, 1846.**

#### **Botrylloides parvulum, n. sp.**

(Tab. II, fig. 29—31).

Kun en liden cormus blev funden. Længden 12<sup>mm</sup>, bredden 10<sup>mm</sup> og tykkelsen 2<sup>mm</sup>. Farven er mørk violet med smaa kridhvide flækker, der fremkommer derved, at stolonudvidelsernes tykke ende er hvidpigmenteret. Den øvrige del af stolonerne var violetfarvet. Individerne var ligeledes violette med en del af oversiden hvidpigmenteret.

Den fælles tunica er meget fast og næsten opak.

Individerne sad meget tæt ved hinanden uden at der paa den lille cormus lod sig iagttage noget tydeligt system.

Individernes længde ikke over 1<sup>mm</sup>.

Tentaklernes antal lod sig paa grund af individernes stærke pigmentation ikke bestemme. Kun saaes tydelig 2 større laterale.

Branchialsækken med 11—12 rækker stigmata. Formen *d.* 4—2—2—4 *v.*

Stolonudvidelserne er relativt store.

Æg og larver er pomerantsgule af farve og af usædvanlig størrelse.

Ovennævnte cormus fandt jeg i en dybde af 4 favne ved Espevær fastheftet til en laminariestilk.

The branchial sac has from 10 to 12 rows of stigmata: formula usually *d.* 8—5—5—8 *v.*

**Var. *P. inradiatus*** is only distinguished from the type form by the total absence of light radiating bands, and by the greater transparency of the common tunic.

**Var. *P. rufus***, besides the above-mentioned 4 tentacles, has 4 extremely small ones alternating with the former, but otherwise in its anatomy, is exactly like the type-form. The colour of the members is a reddish brown, and the common tunic, during life, is transparent. The stolonial dilatations are of a yellowish white colour.

The type-form and var. *P. inradiatus* both occurred very generally in July at Espevær and Bømmeløen, where they were the most frequently met with of any of the Synascidæ, the type-form more frequently than the variety. Both forms were found at a depth of from 3 to 6 fathoms, in the same localities, sometimes grown together into a lump without its being possible for me to see where one left off and the other began, notwithstanding the examination of more than 100 cormi of both forms together. In colour, the type-form very closely resembles *Botryllus morio*, Giard, and *B. aurolineatus*, Giard. The variety *P. rufus* was not uncommon at Andenæs, in July.

### **Botrylloides, Milne-Edwards, 1846.**

#### **Botrylloides parvulum, n. sp.**

(Pl. II, figs. 29—31).

Only one small cormus found, length 12<sup>mm</sup>, breadth 10<sup>mm</sup> and thickness 2<sup>mm</sup>. The colour is dark purple with small chalky white spots occasioned by the white pigmentation of the thick ends of the stolon dilatations. The rest of the stolons is purple. The members are also purple with part of the upper side white.

The common tunic is very firm and almost opaque.

The members are placed very close to one another, and no distinct systems can be observed.

The length of the members is not more than 1<sup>mm</sup>.

On account of the rich pigmentation of the members, the number of the tentacles could not be determined. Only 2 large lateral ones were clearly seen.

The branchial sac has 11 or 12 rows of stigmata: formula, *d.* 4—2—2—4 *v.*

The stolon dilatations are relatively large.

The ova and larvæ are of an orange yellow colour, and unusually large.

I found the above cormus at Espevær, attached to a Laminaria stem, at a depth of 4 fathoms.

**Sarcobotrylloides, Drasche.****Sarcobotrylloides aureum, Sars, 1851.**

1851. *Botrylloides aureum*, Sars. Nyt Mag. for Nat.  
Bd. VI.

Til prof. Sars's beskrivelse skal jeg føie:

Cormus danner oftest læbeformige klumper med en tykkelse af indtil 2 cm. og en længde af indtil 3 cm.; sjeldnere tynde betræk over skjæl.

Individernes høide omtr. 2<sup>mm</sup>.

Tentaklerne: 8 i antal; 4 længere og 4 kortere alternerende. Forskjellen i længde dog ubetydelig.

Branchialsækkens antal stigmata og stigmarækker har jeg ved undersøgelsen af Sars typeexemplarer fundet at afvige fra det af denne forfatter opgivne. Stigmarækkerne viste sig nemlig at være 10—12 i antal og formen for hver række alm. *d.* 6—4—4—6 *v.*

Denne art forekommer alm. ved Finmarkens kyster i en dybde af 30—50 favne. I Upsala museums zool. samling fandtes exemplarer fra Porsangerfjorden angivelig fra en dybde af 100 favne.

**Sarcobotrylloides espeværense, n. sp.**

(Tab. II, fig. 32).

Cormus klumpet eller læbet incrusterende forskellige alger; længden indtil 8 cm. og tykkelsen indtil 2 cm. Sjeldnere danner den 2—3<sup>mm</sup> tykke betræk over skjæl.

Den fælles tunica er meget fast, transparent med de pomerantsgule stolonier gjennejskinnende.

Systemerne hyppigst grenede, ikke sjelden elliptiske eller endog cirkulære.

Individernes længde henimod 2<sup>mm</sup>, farven lysere eller mørkere teglstensrød, hvorved den hele cormus faar et teglstensrødt udseende.

Tentaklerne: 8, hvoraf 4 længere alternerer med 4 kortere.

Branchialsækken med 12—14 rækker stigmata. Formlen alm. *d.* 5—3—3—4 *v.*

Forekom temmelig sjelden i juli maaned ved Espevær og Bømmeløen i en dybde af 3—5 favne; men almindeligere i marts maaned paa samme lokaliteter. Ved Beian fandt jeg denne art mindre hyppig (juli).

Den ligner i farvetegning *botrylloides pusilla*, Alder, og *b. rubrum*, Milne-Edwards, men adskiller sig fra disse arter ved branchialsækkens forskellige dannelselse og koloniens større tykkelse.

**Sarcobotrylloides, Drasche.****Sarcobotrylloides aureum, Sars, 1851.**

1851. *Botrylloides aureum*, Sars. Nyt Mag. for Nat.  
Bd. VI.

I will supplement Prof. Sars's description with a few remarks.

The cormus, as a rule, is in the form of labiate lumps with a maximum thickness of 2 cm. and a maximum length of 3 cm.; it is occasionally found in the form of a thin investment of shell.

The height of the members is about 2<sup>mm</sup>.

The tentacles are 8 in number, 4 long and 4 shorter, alternating with one another. The difference in length is, however, inconsiderable.

On examining Sars's type-specimen, I find the number of stigmata and of rows in the branchial sac to differ from the figures given by that author, the rows of stigmata being from 10 to 12 in number, with the formula for each row generally *d.* 6—4—4—6 *v.*

This species occurs frequently on the coast of Finmark, at depths of from 30 to 50 fathoms. In the zoological collection in the Upsala Museum, there are specimens from Porsanger Fjord, stated to be from a depth of 100 fathoms.

**Sarcobotrylloides espeværense, n. sp.**

(Pl. II, fig. 32).

The cormus is in masses or lobes, investing various sea-weeds. Maximum length 8 cm. and thickness 2 cm. It occasionally forms a covering of 2 or 3<sup>mm</sup> thickness over shell.

The common tunic is very firm and transparent, with the orange-coloured stolons showing through.

The systems are often ramified, not infrequently elliptical or even circular.

The length of the members is about 2<sup>mm</sup>, colour a more or less dark brick-red, which gives the whole cormus a brick-red appearance.

There are 8 tentacles, 4 long and 4 short alternating.

The branchial sac has from 12 to 14 rows of stigmata: formula generally *d.* 5—3—3—4 *v.*

This species was of rather rare occurrence in July at Espevær and Bømmeløen at depths of from 3 to 5 fathoms; but it was more plentiful in March in the same localities. At Beian I found it less frequently in July.

In colouring, this species resembles *Botrylloides pusilla*, Alder, and *B. rubrum*, Milne-Edwards, but differs from them in the formation of the branchial sac, and in the greater thickness of the colonies.



## Tavleforklaring.

### Tab. I.

- Fig. 1—2. *Didemnoides variabile*, n. sp.  
 „ 3. *Distaplia clavata*, Sars.  
 „ 4—7. *Glossophorum sabulosum*, Giard.  
 „ 8—10. *Aplidiopsis pomum*, Sars.  
 „ 11—13. *Aplidiopsis sarsii*, n. sp.

*br.* = branchialsæk.      *ov.* = æg.  
*c.* = hjertet.      *rc.* = rectum.  
*ec.* = ectoderm.      *t.* = testes.  
*end.* = endostyl.      *tu.* = den fælles tunica.  
*h.* = ydre hinde.      *u.* = dorsal uposning paa  
*lg.* = fremmede smaalegemer oesophagus.  
i den fælles tunica.      *rd.* = vas deferens.  
*k.* = kiselsyreplader.      *vn.* = ventrikel.  
*æ.* = æsophagus.      *ægl.* = ægleder.

- Fig. 1. *Didemnoides variabile*. Kolonier fæstede til en alge. I den fælles tunica smaa kugleformige legemer (*lg*) indleirede. Nat. st.  
 „ 2. — — — Snit gennem en af de kugleformige legemer. Forstørret.  
 „ 3. *Distaplia clavata*. Koloni. Nat. st.  
 „ 4. *Glossophorum sabulosum*. Koloni. Nat. st.  
 „ 5. — — — Abdomen. Forstørret.  
 „ 6. — — — Et stykke af postabdomen med æg og testikler. Forstørret.  
 „ 7. — — — Postabdominal knopdannelse. Forstørret.  
 „ 8. *Aplidiopsis pomum*. Koloni. Nat. st.  
 „ 9. — — — Et helt dyr. Forstørret.  
 „ 10. — — — Abdomen. Forstørret.  
 „ 11. — *sarsii*. Koloni. Nat. st.  
 „ 12. — — — Et helt dyr. Forstørret.  
 „ 13. — — — Abdomen. Forstørret.

### Tab. II.

- Fig. 14—16. *Aplidium lacteum*, n. sp.  
 „ 17—19. *Amaroucium mutabile*, Sars.  
 „ 20—22. *Parascidium crispum*, n. sp.  
 „ 23—25. *Synoiicum incrustatum*, Sars.

## Explanation of the Plates.

### Plate I.

- Fig. 1, 2. *Didemnoides variabile*, n. sp.  
 „ 3. *Distaplia clavata*, Sars.  
 „ 4—7. *Glossophorum sabulosum*, Giard.  
 „ 8—10. *Aplidiopsis pomum*, Sars.  
 „ 11—13. *Aplidiopsis sarsii*, n. sp.

#### Abbreviations employed:

*br.* = branchial sac.      *ov.* = ovum.  
*c.* = heart.      *rc.* = rectum.  
*ec.* = ectoderm.      *t.* = testes.  
*end.* = endostyle.      *tu.* = common tunic.  
*h.* = external membrane.      *u.* = dorsal expansion of the  
*lg.* = foreign particles in the oesophagus.  
common tunic.      *rd.* = vas deferens.  
*k.* = silicic acid plates.      *vn.* = ventricle.  
*æ.* = æsophagus.      *ægl.* = oviduct.

- Fig. 1. *Didemnoides variabile*. Colonies attached to a sea-weed. Small globular particles (*lg*) embedded in the common tunic. Natural size.  
 „ 2. — — — Section through one of the globular particles. Magnified.  
 „ 3. *Distaplia clavata*. Colony. Nat. size.  
 „ 4. *Glossophorum sabulosum*. Colony. Nat. size.  
 „ 5. — — — Abdomen. Magnified.  
 „ 6. — — — Portion of post-abdomen with ova and testicles. Magnified.  
 „ 7. — — — Post-abdominal gemmation. Magnified.  
 „ 8. *Aplidiopsis pomum*. Colony. Nat. size.  
 „ 9. — — — An entire member. Magnified.  
 „ 10. — — — Abdomen. Magnified.  
 „ 11. — *sarsii*. Colony. Nat. size.  
 „ 12. — — — An entire member. Magnified.  
 „ 13. — — — Abdomen. Magnified.

### Plate II.

- Figs. 14—16. *Aplidium lacteum*, n. sp.  
 „ 17—19. *Amaroucium mutabile*, Sars.  
 „ 20—22. *Parascidium crispum*, n. sp.  
 „ 23—25. *Synoiicum incrustatum*, Sars.

- Fig. 26. *Botryllus marionis*, Giard.  
 „ 27. — *violaceus*, Milne-Edwards.  
 „ 28. *Polycyclus fuscus* (typef.), n. sp.  
 „ 29—31. *Botrylloides parvulum*, n. sp.  
 „ 32. *Sarcobotrylloides esperærense*, n. sp.

æ. = œsophagus.

vd. = vas deferens.

rc. = rectum.

vn. = ventrikel.

- Fig. 14. *Aplidium lacteum*. Koloni. Nat. st.  
 „ 15. — — Et helt dyr. Forstørret.  
 „ 15. — — Snit gennem abdomen i høide med ventrikelen. Forstørret.  
 „ 17. *Amaroucium mutabile*. Koloni. Nat. st.  
 „ 18. — — Et helt dyr. Forstørret.  
 „ 19. — — Abdomen. Forstørret.  
 „ 20. *Parascidium crispum*. Koloni. Nat. st.  
 „ 21. — — Et helt dyr. Forstørret.  
 „ 22. — — In- og egestionsaabning med analtunge seede ovenfra. Forstørret.  
 „ 23. *Synoicum incrustatum*. Koloni. Nat. st.  
 „ 24. — — Et helt dyr. Forstørret.  
 „ 25. — — Abdomen. Forstørret.  
 „ 26. *Botryllus marionis*. Ingestionsaabning med tentakelkrans og flimmersøm seede indenfra. Forstørret.  
 „ 27. — *violaceus*. Ingestionsaabning med tentakelkrans og flimmersøm seede indenfra. Forstørret.  
 „ 28. *Polycyclus fuscus* (typef.). Ingestionsaabning med tentakelkrans og flimmersøm seede indenfra. Forstørret.  
 „ 29. *Botrylloides parvulum*. Vertikalt snit gennem kolonien, hvori 2 dyr og gennemskaarne stoloner. Forstørret.  
 „ 30. — — Snit gennem testikel. Forstørret.  
 „ 31. — — Snit gennem ventrikelen. Forstørret.  
 „ 32. *Sarcobotrylloides esperærense*. Koloni. Nat. st.

- Fig. 26. *Botryllus marionis*, Giard.  
 „ 27. — *violaceus*, Milne-Edwards.  
 „ 28. *Polycyclus fuscus* (type), n. sp.  
 Figs. 29—31. *Botrylloides parvulum*, n. sp.  
 Fig. 32. *Sarcobotrylloides esperærense*, n. sp.

Abbreviations employed:

æ. = œsophagus.

vd. = vas deferens.

rc. = rectum.

vn. = ventricle.

- Fig. 14. *Aplidium lacteum*. Colony. Nat. size.  
 „ 15. — — An entire member. Magnified.  
 „ 16. — — Section through the abdomen on a level with the ventricle. Magnified.  
 „ 17. *Amaroucium mutabile*. Colony. Nat. size.  
 „ 18. — — An entire member. Magnified.  
 „ 19. — — Abdomen. Magnified.  
 „ 20. *Parascidium crispum*. Colony. Nat. size.  
 „ 21. — — An entire member. Magnified.  
 „ 22. — — Branchial and atrial apertures with anal languet, seen from above. Magnified.  
 „ 23. *Synoicum incrustatum*. Colony. Nat. size.  
 „ 24. — — An entire member. Magnified.  
 „ 25. — — Abdomen. Magnified.  
 „ 26. *Botryllus marionis*. Branchial orifice, with fringe of tentacles and peripharyngeal band, seen from within. Magnified.  
 „ 27. — *violaceus*. Branchial orifice, with fringe of tentacles and peripharyngeal band, seen from within. Magnified.  
 „ 28. *Polycyclus fuscus* (type). Branchial orifice, with fringe of tentacles and peripharyngeal band, seen from within. Magnified.  
 „ 29. *Botrylloides parvulum*. Vertical section through the colony, containing 2 members, and stolons cut through. Magnified.  
 „ 30. — — Section through a testicle. Magnified.  
 „ 31. — — Section through the ventricle. Magnified.  
 „ 32. *Sarcobotrylloides esperærense*. Colony. Nat. size.









DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

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ZOOLOGI.

ASCIDIÆ SIMPLICES OG ASCIDIÆ COMPOSITÆ.  
FRA NORDHAVS-EXPEDITIONEN.

VED

KRISTINE BONNEVIE.

MED 2 TAVLER.



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CHRISTIANIA.

GRØNDAHL & SØNS BOGTRYKKERI.

—  
1896.

THE NORWEGIAN NORTH-ATLANTIC EXPEDITION

1876—1878.

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ZOOLOGY.

ASCIDIÆ SIMPLICES AND ASCIDIÆ COMPOSITÆ.

FROM THE NORTH ATLANTIC-EXPEDITION.

BY

KRISTINE BONNEVIE.

WITH 2 PLATES.



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CHRISTIANIA.

PRINTED BY GRØNDAHL & SØN.

1896.







Den samling af Ascidier, som forelaa fra den norske Nordhavsexpedition, blev mig i høsten 1894 overladt til undersøgelse, og samtidig fik jeg til afbenyttelse nogle tegninger, udførte af professor G. O. Sars efter levende individer. Jeg tillader mig herved at bringe Nordhavsexpeditionens redaktionskomite, professorerne H. Mohn og G. O. Sars, min tak, fordi dette interessante materiale er bleven mig overladt.

I to andre afhandlinger i samme bind har Kiær og Huitfeldt redegjort for de tidligere arbejder, som berører Norges ascidier, og jeg finder det overflødigt her atter at gjentage dette. For de arters vedkommende, som allerede er beskrevne af Kiær eller Huitfeldt i en af de nævnte afhandlinger, slutter jeg mig ogsaa til dem baade hvad beskrivelse, synonymi og literatur angaar.

Ved bestemmelsen af arterne har jeg rettet mig efter Herdmans systematiske fremstilling.

Det materiale af ascidier, som forelaa til undersøgelse, bestod af 11 forskjellige arter af enkelte ascidier og 10 arter af sammensatte. Men flere af dem er desværre ikke saa vel konserveret, at det er muligt at foretage nogen nøiagtig undersøgelse af deres anatomi, og da der kun for nogle enkeltes vedkommende medfølger tegninger efter de levende individer eller kolonier, har jeg heller ikke kunnet benytte farven som ledetraad ved bestemmelsen. Endelig fandtes af de fleste kun et enkelt exemplar, og saaledes har undersøgelsen, især af Synascidierne men ogsaa af et par af de enkle, havt sine vanskeligheder, og jeg er af den grund nødt til at lade et par arter staa som usikre.

The collection of Ascidiae resulting from the Norwegian North Atlantic Expedition, was submitted to me in the autumn of 1894 for examination, and at the same time I was permitted to make use of some drawings executed by Prof. G. O. Sars from living specimens. I venture here to express my thanks to the editing committee of the Norwegian North Atlantic Expedition, Prof. H. Mohn and Prof. G. O. Sars, for having submitted this interesting material to my inspection.

In two other papers in this number, Messrs Kiær and Huitfeldt give an account of the earlier works which touch on the subject of Norwegian Ascidiae, and I therefore consider it superfluous to repeat this here. With regard to those species which have already been described by Kiær or Huitfeldt in one or other of the above-named papers, I agree with them, as regards description, synonyma and bibliography.

In determining the species, I have followed Herdman's systematic classification.

The material to be examined consisted of 11 different species of Simple Ascidiæ and 10 species of Compound Ascidiæ. Several of them, however, are unfortunately not in a sufficiently good state of preservation to allow of the possibility of any minute examination of their anatomy, and as only a few are accompanied by drawings from living specimens or colonies, I have not been able to make use of the colour as a clue to their determination. Lastly, of most of the species there was only a single specimen, and thus the examination of two or three of the simple species, but especially of the Synascidiæ, has been attended with difficulty, and for this reason I am obliged to leave a few of the species undetermined.



## I. Ascidiae simplices.

Nordhavsexpeditionens Ascidiae simplices bestaar som ovenfor nævnt, af 11 arter, hvoraf 6, som tidligere er beskrevne og 5 nye.

Arterne er følgende:

- Fam. *Ascidiidæ*: *Ciona gelatinosa*, nov. sp.\*  
                  *Ascidiella patula*, Müller.  
Fam. *Cynthiidæ*: *Cynthia pyriformis*, Rathke.  
                  *Styela rustica*(?), Linné.  
                  " *bathybia*, nov. sp.  
                  " *cylindriiformis*, nov. sp.  
                  " *uniplicata*, nov. sp.  
                  *Polycarpa libera*, Kiær.  
                  " *pomaria*, Savigny.  
                  " *comata*, Alder.

Fam. *Molgulidæ*: *Paramolgula arctica*, nov. sp.

5 af disse arter, nemlig *Ascidiella patula*, *Cynthia pyriformis*, *Styela rustica*, *Polycarpa libera* og *Polycarpa pomaria*, er omtalte af Kiær som hørende til Norges fauna. De er ogsaa paa Nordhavsexpeditionen fundne omkring Norges kyst i større eller mindre afstand fra denne. *Asc. patula* blev funden temmelig langt tilhavs i n. ø. for Vardø, *Cyn. pyriformis* ved Røst, *St. rustica* syd for Vesteraalseggen, *Pol. libera* ved Lofoten og *Pol. pomaria* ved Tromsø.

Endnu en art, nemlig *Polycarpa comata*, som ikke er omtalt af Kiær, blev funden ved Tromsø sammen med *Pol. pomaria*, og den maa saaledes ogsaa regnes blandt Norges ascidier.

Af de øvrige arter, blev *Ciona gelatinosa* funden i Ishavet. n. for Vardø paa ca. 300 meters dyb, *St. uniplicata* ved Spitsbergens vestkyst paa 761 meters dyb, *St. cylindriiformis* ved Reykjavik, *Paramolgula arctica* ved Jan Mayen og *Styela bathybia* langt tilhavs, s. v. for Spitsbergen paa et meget stort dyb, nemlig 2195 meter.

## I. Ascidiae Simplices.

The Ascidiae Simplices of the Norwegian North Atlantic Expedition comprise, as before stated, 11 species, 6 of which have been already described, and 5 are new species.

The species are as follows:

- Fam. *Ascidiidæ*: *Ciona gelatinosa*, nov. sp.  
                  *Ascidiella patula*, Müller.  
Fam. *Cynthiidæ*: *Cynthia pyriformis*, Rathke.  
                  *Styela rustica*(?), Linnæus.  
                  " *bathybia*, nov. sp.  
                  " *cylindriiformis*, nov. sp.  
                  " *uniplicata*, nov. sp.  
                  *Polycarpa libera*, Kiær.  
                  " *pomaria*, Savigny.  
                  " *comata*, Alder.

Fam. *Molgulidæ*: *Paramolgula arctica*, nov. sp.

Five of these species, viz. *Ascidiella patula*, *Cynthia pyriformis*, *Styela rustica*, *Polycarpa libera* and *Polycarpa pomaria*, are mentioned by Kiær as belonging to the fauna of Norway. In the Norwegian North Atlantic Expedition they were also found round, and at varying distances from the coasts of Norway. *Ascidiella patula* was found rather far out to sea to the N. E. of Vardø, *Cynthia pyriformis* near Røst, *Styela rustica* to the south of Vesteraalseggen, *Polycarpa libera* at Lofoten, and *Polycarpa pomaria* at Tromsø.

One other species, which has not been mentioned by Kiær, viz. *Polycarpa comata*, was found at Tromsø together with *P. pomaria*, and should therefore be included among the Norwegian Ascidians.

Of the remaining species, *Ciona gelatinosa* was found in the Arctic Ocean to the N. of Vardø, at a depth of about 300 metres; *Styela uniplicata* off the west coast of Spitzbergen, at a depth of 761 metres; *Styela cylindriiformis* at Reykjavik, *Paramolgula arctica* off Jan Mayen, and *Styela bathybia* far out to sea S. W. of Spitzbergen, at a very great depth, namely, 2195 metres.

**Ciona gelatinosa**, nov. sp.

(Pl. III, fig. 1).

Den er 15—20 cm. høj, cylinderformet; grundfladens diameter er ca. 3 cm., og afstanden mellem aabningerne omtrent lige stor.

*Kappen* er klar, geleagtig og meget tyk.

Begge *aabninger* sidder paa lange siphoner, mundsiphonen er længst med aabningen rettet forover. Den er skarpt adskilt fra gjællesækken; paa grænsen sidder en række enkle, traadformige tentakler af forskjellig længde. Ingestionsaabningen har 8 lapper og er indvendig omgivet af en række store, noget indskaarne tunger. Egestionsaabningen har 6 lapper.

*Nervegangliet* sidder lige nedenfor grænsen mellem mundsiphonen og gjællesækken.

*Gjællesækken* strækker sig gennem omtrent  $\frac{3}{4}$  af dyrets hvide. *Rygfolden* repræsenteres af en række papiller, temmelig lange og spidse. Paa siderne af gjællesækken er der ingen folder; men tverribberne er tæt besat med store papiller.

*Oesophagus* er kort og trang, skarpt afsat mod *maven*, som er ægformig. Den er udvendig glat, indvendig stribet, og gaar jævnt over i tarmen, som stiger næsten ret op imod kloaksiphonens grund. *Anus* har mange lapper. Hele tarmtractus ligger paa højre side af gjællesækken, og strækker sig ikke længere ned end denne.

*Ovariet* er stort, hjerteformet og ligger i den bue, som dannes mellem maven og tarmen. Oviducten løber sammen med tarmen op paa dyrets højre side og ender med et kølleformet legeme, som strækker sig et par mm. ovenfor anus.

*Muskulaturen* er meget sterkt udviklet, ligt paa begge sider. Den er nedentil fæstet til kappens bund. De langsgaaende muskelfibre er tykke og meget iøinefaldende, og mellem dem er udspændt et net af tyndere fibre i forskjellige retninger.

Tegningen (fig. 1) er udført af professor G. O. Sars efter et levende individ, og han har betegnet den som en ny art. Men da den er meget daarlig konserveret, er det mig desværre ikke muligt at levere nogen nøiere beskrivelse af den, end ovenstaaende.

Foruden i størrelsen, afviger den fra *Ciona intestinalis* i tarmkanalens stilling til gjællesækken.

Den blev funden den 30te juni 1878 ved 72.38° N. Br., 33.50° ø. L., paa et dyb af 293 meter med temperatur 0.7° C.

**Ascidella patula**, Müller.

(Pl. III, fig. 2—4).

(om synonymi og literatur, se Kiær).

15—20 mm. høj og ca. 10 mm. bred, sidder fæstet til underlaget med basis og noget af venstre side. Afstanden

**Ciona gelatinosa**, nov. sp.

(Pl. III, fig. 1).

This species is 15.20 centim. in height, cylindrical in form, the diameter of the base being about 3 centim. and the distance between the apertures about the same.

The *tunic* is clear, gelatinous and very thick.

Both *orifices* are situated on long siphons, that of the mouth being the longer, with the opening directed forwards. It is sharply separated from the branchial sac; on the boundary is a row of simple, filiform tentacles of various lengths. The branchial orifice is 8-lobed and surrounded interiorly by a row of large, somewhat incised languets. The atrial aperture is 6-lobed.

The *nerve ganglion* is found immediately below the boundary between the oral tube and the branchial sac.

The *branchial sac* extends through about  $\frac{3}{4}$  of the animal's height. The *dorsal lamina* is represented by a row of rather long and pointed papillæ. On the sides of the branchial sac there are no folds, but the transverse bars are thickly set with large papillæ.

The *oesophagus* is short and narrow, and sharply divided from the *stomach* which is ovate in shape. It is smooth exteriorly and corrugated interiorly, and merges gradually into the intestine, which rises almost vertically to the bottom of the anal tube. The *anus* has numerous lobes. The whole of the intestinal region lies to the right of and does not extend lower than the branchial sac.

The *ovary* is large and heart-shaped, and lies in the arch formed between the stomach and the intestine. The oviduct runs parallel with the intestine up the right side, ending in a club-shaped body which extends a few millim. above the anus.

The *musculature* is very strongly developed, the two sides being similar. It is attached below to the bottom of the tunic. The longitudinal muscle-fibres are thick and very conspicuous, and between them is stretched a net of finer fibres running in various directions.

Fig. 1 was drawn by Prof. G. O. Sars from a living specimen, and designated by him as a new species. As, however, it has been very badly preserved, it is unfortunately impossible for me to give a more exact description of it than the above.

It differs from *Ciona intestinalis* not only in size, but also in the relative positions of the intestinal canal and the branchial sac.

It was found on June 30th, 1878, in 72.38° N. Lat. and 33.50° E. Long. at a depth of 293 metres, with a temperature of 0.7° C.

**Ascidella patula**, Müller.

(Pl. III, figs. 2—4).

(For synonyms and bibliography, vide Kiær).

Height 15.20 millim., breadth about 10 millim. It adheres by the base and part of the left side. The distance



mellem aabningerne er ca. 3 mm. Ingestionsaabningen sidder øverst, egestionsaabningen noget længer nede.

*Kappen* er klar og gjennemsigtig, med kar ligelig fordelt over det hele. Enkelte steder, især omkring aabningerne findes stumpe forhøininger. Muskulaturen er næsten bare udbredt paa høire side.

*Ingestionsaabningen* har 8 lapper og er omgivet af en krans af lange, trekantede tentakler. *Egestionsaabningen* har 6 lapper.

*Flimmersømmen* dannes af en dobbelt membran og flimmerorganet er en tragtformig grube, noget bredere end høj.

*Gjællesækkens rygfold* er en tungeformet membran. Paa siderne er der ingen folder; men der findes rudimentære papiller, ligesom den øverste ende af længderibberne bøies ind i gjællesækken som papiller.

Hele *tarmkanalen* ligger paa venstre side i nær forbindelse med generationsorganerne. Nyrekonkrementer findes baade i tarmvæggen og i muskellaget. *Anus* har to tilbagebøjede læber.

Den blev fundet 29de juni 1878, ved 71.42° n. Br., 37.1° ø. L. og paa et dyb af 271 m. Temperatur —1.43 C.

#### ***Cynthia pyriformis*, Rathke.**

(Se Kiær, ang. beskrivelse og synonymi).

Fundet ved Røst.

#### ***Styela rustica*?, Linné.**

(Pl. III, fig. 5).

(Om synonymi, se Kiær).

Kroppen er ca. 7 cm. høj, cylinderformet, dog noget smalere nederst end paa midten. Aabningerne sidder begge paa oversiden paa siphoner; mundsiphonen er længst og rettet forover.

*Kappen* er lys brun, læderagtig og rynket, især nedentil.

Begge *aabninger* er 4-lappede; ing.aabningen omgivet af mange, ugrenede tentakler af forskjellig længde.

*Gjællesækken* har 4 folder paa hver side.

*Maven* er stor og stribet udvendig. *Anus* har to læber, ulige lange og begge lappede.

Et ugrenet *ovarium* paa høire side.

Da der kun fandtes et exemplar af denne art, og dette var daarlig konserveret, kan jeg intet domme om gjællesækkens finere struktur, og maa derfor lade arten staa

between the orifices is about 3 millim.; the branchial being the uppermost.

The *tunic* is clear and transparent, with vessels distributed equally over the whole. In a few places, especially round the apertures, there are blunt prominences. The musculature extends almost exclusively over the right side.

The *branchial orifice* is 8-lobed, and is surrounded by a fringe of long triangular tentacles. The *atrial orifice* is 6-lobed.

The *peripharyngeal band* is formed by a double membrane, and the dorsal tubercle is a funnel-shaped pit, somewhat broader than it is deep.

The *dorsal lamina* of the *branchial sac* is a tongue-shaped membrane. There are no folds on the sides, but there are rudimentary papillæ, and the upper ends of the longitudinal bars are bent into the branchial sac as papillæ.

The whole of the *intestinal tube* lies on the left side, closely connected with the generative organs. Kidney concretions are found both in the intestinal wall and in the muscular stratum. The anus has two backward-curving lips.

This specimen was found on June 29th, 1878, in 71.42° N. Lat. and 37.1° E. Long. at a depth of 271 metres, with a temperature of —1.43° C.

#### ***Cynthia pyriformis*, Rathke.**

(For description and synonyms, *vide* Kiær).

Found near Røst.

#### ***Styela rustica*?, Linnæus.**

(Pl. III, fig. 5).

(For synonyms, *vide* Kiær).

The body is about 7 centim. high, cylindrical in shape, though somewhat narrower at the base than in the middle. Both the apertures are situated on the upper side on siphons, the oral siphon being the longer of the two, and directed forwards.

The *tunic* is of a light brown colour, coriaceous and wrinkled, especially near the base.

Both the *apertures* are 4-lobed, and the branchial is surrounded by a number of simple tentacles of various lengths.

The *branchial sac* has 4 folds on each side.

The *stomach* is large, and corrugated exteriorly. The *anus* has 2 lips of unequal length, both lobed.

There is a simple *ovary* on the right side.

As there was only one specimen of this species, and that was badly preserved, I am unable to judge of the finer structure of the branchial sac, and must therefore

som usikker; men hvad den ydre bygning angaar, og med hensyn til tarmkanalens forløb, passer den paa *Styela rustica*.

Den blev fundet 21de juni 1877, ved 67.24° N. Br., 8.58° ø. L. og paa et dyb af 827 m. Temperatur —1° C.

Tegningen (fig. 5) er udført af professor *G. O. Sars* efter et levende individ.

***Styela bathybia*, nov. sp.**

(Pl. III, figs. 6—14).

En liden, ægformet dybvands ascidie, omtrent 1.5 cm. bred og ikke fuldt saa hoi. Aabningerne sees paa oversiden som hvide kryds, og afstanden mellem dem er ca. 5<sup>mm</sup>.

*Kappen* er paa spiritusexemplarer graabrun, uden rynker eller folder, og gjennemskinnelig. Den er forsynet med heftetraade, hvortil er fæstet smaa skjæl og sand. Den er ikke fæstet til noget underlag.

Begge *aabninger* har 4 lapper og er siddende. *Tentaklerne* om ingestionsaabningen er af forskjelligt udseende. Der er ca. 10 store, trekantede tentakler, et par mm. lange, og imellem dem lige mange mindre, traadformige; indenfor hver af disse sidste findes en liden tap, en rudimentar tentakel.

*Gjællesækken* strækker sig gennem dyrets hele længde. *Rygfolden* er en membran, noget rynket og med lange, spidse tænder; den er bøiet til høire. Paa hver side af gjællesækken er der 4 folder af forskjellig størrelse, som konvergerer mod svelget. De bagerste, nærmest rygfolden, er dybe, sammensatte af 9 længderibber; det næste par bestaar kun af 6, men det tredje atter af 8—9. Dernæst følger paa hver side et feldt paa 8—10 længderibber, og saa kommer fjerde fold, som kun bestaar i, at 5—6 længderibber er stillet tæt ved hinanden. Paa høire side er der endnu som et tilløb til en femte fold, idet der paa den forreste del af feldtet mellem fjerde fold og endostylen optræder 6 tætstillede længderibber, som dog alle snart forsvinder. Dette forreste feldt er i det hele meget uregelmæssigt; saavel længde- som tverribber hører pludselig op, og gjællespalterne gaar ofte over i hinanden. Baade længde- og tverribber er meget tynde og rager ikke ind i gjællesækken; det regelmæssige forhold er, at de deler denne i kvadratiske felter, med 4 stigmata i hvert.

*Oesophagus* er kort; *maven* er meget liden, ret og sribet udenpaa; den ligger paa undersiden af dyret. *Tarmen* stiger op paa venstre side af gjællesækken. *Anus* har tre læber, hvis yderkanter er bøiede udover.

*Generationsorganer* findes paa begge sider, fæstet til muskellaget. De er hermaphroditiske, sammensatte af et

leave the determination of the species uncertain; but as regards the exterior structure, and the course of the intestinal tube, it resembles *Styela rustica*.

It was found on June 21st, 1877, in 67.24° N. Lat. and 8.58° E. Long. at a depth of 827 metres, with a temperature of —1° C.

The figure (fig. 5) was drawn by Prof. *G. O. Sars* from a living specimen.

***Styela bathybia*, nov. sp.**

(Pl. III, figs. 6—14).

A small, deep-water Ascidian, ovate in shape; breadth about 1.5 centim., and height rather less. The apertures are visible on the upper side as white crosses, and the distance between them is about 5 millim.

In spirit specimens *the tunic* is of a greyish brown colour, without wrinkles or folds, and translucent. It is furnished with fibres, to which are attached small shells and sand. It does not adhere to any substratum.

Both *orifices* are 4-lobed and sessile. *The tentacles* about the branchial orifice are of varying appearance. There are about 10 large triangular tentacles a few millim. in length, and in among these, as many smaller filiform ones. Within each of the latter, there is a small tubercle, a rudimentary tentacle.

*The branchial sac* extends throughout the entire length of the animal. *The dorsal lamina* is a somewhat wrinkled membrane with long pointed teeth: it curves to the right. On each side of the branchial sac there are 4 folds of various sizes, converging towards the gullet. The hindmost ones, nearest to the dorsal lamina, are deep, and composed of 9 longitudinal bars; the next pair consist of only 6, but the third again of 8 or 9. Next to these on each side is a field of from 8 to 10 longitudinal bars, and then comes the fourth fold, which consists of only 5 or 6 longitudinal bars placed close to one another. On the right side there is even the appearance of a fifth fold, there being 6 closely-placed longitudinal bars in the front of the region between the fourth fold and the endostyle, but these all soon disappear. This foremost compartment is, on the whole, very irregular; both the longitudinal and the transverse bars suddenly cease, and the branchial stigmata are often merged in one another. The longitudinal and the transverse bars are very thin, and do not project into the branchial sac; as a rule they divide it into square compartments with 4 stigmata in each.

*The oesophagus* is short; *the stomach* is very small, straight and corrugated exteriorly: it is situated on the inferior side of the animal. The intestine ascends on the left side of the branchial sac. *The anus* has 3 lips, whose outer edges are curved outwards.

*The generative organs* are found on both sides, attached to the muscular stratum. They are hermaphroditic,



langt rør, tilspidset i den nedre ende, hvori æggene findes, og en hel del spermasække, som sidder fæstet til rørets øvre ende og kommunikerer med dette. Paa venstre side findes kun et par saadanne, medens ovariet har samme størrelse paa begge sider.

Den blev fundet den 19de juli 1878 ved 75.12° N. Br., 3.20° ø. L. paa et dyb af 2195 m.; temperatur  $\div$  1.57° C.

**Styela cylindriformis**, nov. sp.

(Pl. III, fig. 15—18.).

Denne art har form som en lav cylinder, fasthæftet med hele undersiden, og hvis overflade er svagt konveks. Den er ca. 2 cm. i diameter, 1.5 cm. høj, og med ca. 5 mm. mellem aabningerne, som begge findes paa den konvekse overside.

*Kappen* er paa spirituseksemplarer lys graaagtig, og noget incrusteret med sand. Den er temmelig tyk og paa indersiden skinnende hvid.

*Muskulaturen* er svagt udviklet.

Begge *aabninger* har 4 lapper og er siddende. *Tentaklerne* om ingestionsaabningen er af 3 forskellige størrelser og har en eiendommelig form. Hver af dem er begrænset af 4 flader; men to sammenstødende af disse er mere udviklet end de to andre, saa tentakelen faar en bøjning som et knæ. Der er ca. 30 tilsammen af de to største, som veksler med hinanden i en række, og desuden lige mange smaa tentakler, som er fæstet lidt indenfor de større og udfylder alle mellemrum mellem disse.

*Flimmerorganet* er stort og rundt med en spalteformig aabning. Nervegangliet ligger lige bag dette og er aflangt.

*Gjællesækkens* længdeakse er næsten parallel undersiden af kappen. *Rygfolden* er en bred membran, bøiet til venstre, noget rynket og med hel, omboiet rand. Paa hver side findes 4 tydelige folder, som konvergerer mod svælget, hver dannet ved sammenrykken af 5—6 længderibber. Disse er temmelig brede membraner, bugtede i kanten; de rager ind i gjællesækken og deler denne i felter paa 6—7 spirakler. Tverribberne er af 3 forskellige størrelser; de største er membraner, af samme bredde som længderibberne, og afgrænser sammen med disse høje, rektangulære felter, hvert paa to stigmatarækker. Disse rækker adskilles ved tverribber af anden størrelse, medens de mindste tverribber gaar over spiraklerne uden at dele dem.

*Tarmkanalen* ligger under gjællesækken. *Maven* er stor, ca. 7 mm. lang og 5 mm. bred, med mange smaa folder, som konvergerer mod tarmen. Denne ligger paa venstre side. *Anus* har mange, udboiede lapper.

*Generationsorganer* er udviklede paa begge sider, som lange, slyngede, rørformige kjertler; de sidder fæstet til

consisting of a long tube, pointed at the lower end, in which are the ova, and a number of sperm cells, which are attached to the upper end of the tube, and communicate with it. On the left side there are only a few such cells, while the ovary is the same size on both sides.

The species was found on July 19th, 1878, in 75.12° N. Lat. and 3.20° E. Long. at a depth of 2195 metres, with a temperature of  $-1.57^{\circ}$  C.

**Styela cylindriformis**, nov. sp.

(Pl. III, figs 15—18.).

This species has the form of a low cylinder, with the upper surface slightly convex, and is attached by the entire lower surface. It is about 2 centim. in diameter, 1.5 centim. high, and with about 5 millim. between the apertures, both of which are on the convex upper surface.

*The tunic*, in spirit specimens, is of a light grey colour, and somewhat incrusted with sand. Its thickness is considerable, and it is of a pure white on the interior.

*The muscular system* is poorly developed.

Both *the openings* are 4-lobed and sessile. *The tentacles* round the branchial orifice are of 3 different sizes and have a peculiar shape. Each of them is confined by 4 surfaces, but two of these, adjacent to one another, are more highly developed than the other two, so that the tentacle has a bend like a knee. Of the two larger sizes, there are about 30 in all, alternating with one another in a row, and as many small tentacles attached a little within the larger ones, and filling up their interspaces.

*The dorsal tubercle* is large and round, with a fissure-like opening. The nerve ganglion, lying immediately behind it, is oblong.

The long axis of *the branchial sac* is almost parallel with the under side of the tunic. *The dorsal lamina* is a broad membrane, curving to the left, somewhat wrinkled, and with an entire, decurved margin. On each side there are 4 distinct folds, converging towards the gullet, each one formed by the compression of 5 or 6 longitudinal bars. These are rather broad membranes, with sinuous edges, projecting into the branchial sac, which they divide into compartments of 6 or 7 spiracles. The transverse bars are of 3 different sizes; the largest are membranes of the same breadth as the longitudinal bars, and, with them, mark off high rectangular compartments, each containing two rows of stigmata. These rows are divided by transverse bars of the second size, while the smallest transverse bars cross the spiracles without dividing them.

*The intestinal canal* lies below the branchial sac. The stomach is large, about 7 millim. long and 5 millim. broad, with numerous small folds converging towards the intestine, which is situated on the left side. *The anus* has numerous outward-bent lobes.

*The generative organs* are developed on both sides in the shape of long, winding, tube-like glands; they are at-

muskellaget og har en saadan udstrækning i horisontal retning, at de næsten danner en sluttet ring. De er hermaphroditiske med æg og sperma udviklet i forskellige slyngninger. Æggene er polygonale, og hvert æg er omgivet af et lag smaa follikelceller.

Den blev funden ved Reykjavik.

**Styela uniplicata**, nov. sp.

(Pl. IV, figs. 19—26.)

Den er omtrent lige bred, som den er høj, ca. 2 cm. paa hver kant. Den er fasthæftet med undersiden, og begge aabninger sees som hvide kryds paa oversiden. Afstanden mellem disse er 7 mm.

*Kappen* er paa spiritusexemplarer graabrun, gennemskinnelig og noget incrusteret med sand. Den har ogsaa fine heftetraade, især paa undersiden.

*Aabningerne* har begge 4 lapper og er siddende. Omkring ingestionsaabningen er der ca. 60 *tentakler*, som varierer noget i størrelse. De er alle enkle, traadformige, og de største findes ret ind for hver af de fire grene af krydset i aabningen.

*Flimmergrubens* aabning er halvcirkelformig og ligger tilhøire for nervegangliets forreste del. Dette er næsten tre gange saa langt som det er bredt, og udsender fortil et par tykke nervetraade, som løber tæt udenom tentakelkransen.

*Gjællesækkens rygfold* er en helrandet membran, buftet i kanten og bøiet til venstre. Adskilt fra denne ved et feldt paa 2 længderibber findes paa hver side en dyb fold, dannet af 10 længderibber. Disse folder er saa dybe, at de næsten støder sammen inde i gjællesækken, og der dannes saaledes en rørformig kanal af den bagerste del af denne. Henimod svelget trykkes denne kanal sammen fra siderne, saa dens hulrum aldeles forsvinder, og den staar som en finne udenpaa gjællesækken. Mellem endostylen og de nævnte folder er gjællesækken glat; men der findes enkelte steder tætstillede længderibber. Dette er tilfældet paa begge sider nær endostylen, 5 længderibber fra denne, og desuden paa venstre side et sted længer inde; det er hver gang 4 længderibber, som er rykket sammen. Mellem endostylen og de dybe folder findes paa hver side ca. 30 længderibber; disse er smale og rager ikke ind i gjællesækken; de har et noget uregelmæssigt forløb, kan bøie af til siden eller pludselig ophøre. Tverribberne er af to størrelser. De største af disse deler i forbindelse med længderibberne gjællesækken i kvadratiske felter, hvert med 3—4 stigmata. De mindste tverribber gaar over spiraklerne i regelen uden at dele dem. I feldtet mellem de dybe folder og rygfolden breder tverribberne sig ud, og stigmatarækkerne smalner af; samtidig gaar ogsaa spiraklerne over i hinanden. Paa høire side af svelget findes en spids læbe.

tached to the muscle stratum, and extend so far in a horizontal direction, that they form almost a complete circle. They are hermaphroditic, having ova and sperm developed in different bends. The ova are polygonal, and each one is surrounded by a layer of small follicles.

This species was found at Reykjavik.

**Styela uniplicata**, nov. sp.

(Pl. IV, figs. 19—26.)

It is nearly as broad as it is high, being about 2 centim. each way. It is attached by the under side, and both apertures are visible as white crosses on the upper surface, the distance between them being 7 millim.

In alcohol specimens *the tunic* is of a greyish brown colour, translucent and somewhat incrustated with sand. It has also fine attaching filaments, especially on the under surface.

Both *the apertures* are 4-lobed and sessile. Around the branchial orifice there are about 60 *tentacles*, somewhat varying in size. They are all simple and filiform, and the largest are to be found immediately within each of the four arms of the cross in the opening.

The aperture of *the dorsal tubercle* is semicircular in form, and is situated to the right of the foremost part of the nerve ganglion. This last is almost 3 times as long as it is broad, and sends out in front a few thick nerve fibres, which run just outside the fringe of tentacles.

*The dorsal lamina* of *the branchial sac* is a plain membrane with a sinuous edge and curving to the left. On each side of, and separated from it by a field of 2 longitudinal bars, is a deep fold formed of 10 longitudinal bars. These folds are so deep that they almost meet in the branchial sac, thereby forming out of the hinder portion of the sac a tube-like channel. Towards the gullet, this channel, is compressed at the sides, so that its cavity entirely disappears, and it stands like a pimple outside the branchial sac. Between the endostyle and the above-named folds, the branchial sac is smooth; but in a few places there are closely-set longitudinal bars. This is the case on both sides near the endostyle, at a distance of 5 longitudinal bars from it, and also on the left side at a place farther in: in each instance 4 is the number of longitudinal bars that are pressed together. Between the endostyle and the deep folds, there are about 30 longitudinal bars to be found on each side; they are narrow, and do not project into the branchial sac. They take a somewhat irregular course, and may turn off to one side, or cease altogether. The transverse bars are of two sizes. The larger of these, in conjunction with the longitudinal bars, divide the branchial sac into square fields, each with 3 or 4 stigmata. The smaller transverse bars cross the spiracles without, as a rule, dividing them. In the space between the deep folds and the dorsal lamina, the transverse bars become broader, and the rows of stigmata narrower, while at the same time the spiracles are merged in one another. To the right of the gullet there is a pointed lip.



*Oesophagus* er tynd og ret. *Maven* er liden, valseformet med ca. 12 folder, som ikke rækker helt hen til tarmen. Paa den foldeløse del af maven findes en udbugtning, lever, og hele tarmkanalen er omspundet af et fint netværk. Tarmen stiger paa venstre side ret op og bøier derpaa under spids vinkel nedover omtrent til svelget, saa atter vertikalt opover og nu lidt højere end forrige gang. *Anus* er helrandet med omboiet kant.

*Generationsorganer* findes kun paa højre side, og be-  
staar i et firedelt ovarium og spermasække, som omkranser hver del af dette.

Den blev funden den 12te aug. 1878 ved 78.2° N. Br., 9.25° ø. L. og paa et dyb af 761 m. med temperatur 0.77° C.

### **Styela uniplicata, var. minuta.**

(Pl. IV, fig. 26).

Som en varietet af *St. uniplicata* opfatter jeg en liden ascidie, cylinderformet med diameter ca. 10 mm. og højde 7 mm.

*Kappen* er noget lysere end hos den forrige; men den er ogsaa her incrusteret og forsynet med hæftetraade nederst.

Begge *aabninger* er 4-lappede. Tentaklerne om in-  
gestionsaabningen er afvekslende lange og korte, ca. 20 af hver sort.

*Flimmerorganet* er hesteskoformet.

Forøvrig stemmer den med hensyn til gjællesækkens og tarmkanalens bygning fuldstændig med den forrige og har, ligesom denne, generationsorganer kun paa højre side.

Efter *Kiær* er et af slægtsmerkerne hos *Styela*, at den har „mave uden lever“; men da denne art efter alle andre kjendemerker maa være en *Styela*, falder altsaa tilstedeværelsen eller mangelen af lever bort som slægtsmerke.

### **Polycarpa libera, Kiær.**

(Se Kiær's beskrivelse).

Fundet den 29de juni 1877, ved 68.21° N. Br., 10.40° ø. L. paa et dyb af 836 m. med temperatur —0.70° C.

### **Polycarpa pomaria, Savigny.**

(Pl. IV, fig. 27).

(Hvad synonymi og literatur angaar, slutter jeg mig til Kiær).

Den har form som en afstumpet kegle med basis omtrent saa bred som dyrets højde, 2—3 cm. Den er

*The oesophagus* is thin and straight. *The stomach* is small and cylindrical with about 12 folds, which do not reach quite as far as to the intestine. There is a process, — the liver. — on that part of the stomach which is without folds, and the whole of the intestinal tube is enclosed in a fine network. The intestine ascends vertically on the left side, and then bends at a sharp angle down almost to the gullet, then once more vertically upwards, this time going a little higher than before. *The anus* is plain, with the edge bent backwards.

*The generative organs* are to be found only on the right side, and consist of an ovary divided into 4 parts, each part being surrounded by sperm-cells.

This species was found on Aug. 12th, 1878, in 78.2° N. Lat. and 9.25° E. Long. at a depth of 761 metres, with a temperature of 0.77° C.

### **Styela uniplicata, var. minuta.**

(Pl. IV, figs. 26).

A small Ascidian, which I take to be a variety of *S. uniplicata*, cylindrical in shape, with a diameter of 7 millim.

*The tunic* is rather lighter than in the preceding specimen; but here too it is incrustated with sand and furnished with attaching-fibres below. Both apertures are 4-lobed. The tentacles about the branchial orifice are alternately long and short, about 20 of each.

*The dorsal tubercle* is of a horse-shoe shape. With regard to the structure of the branchial sac and the intestinal canal, there is a similarity with the preceding specimen, and like it, the generative organs are only on the right side.

According to Kiær, one of the generic characters of the *Styela* is that it has „a stomach without a liver“; but as this species, according to all other characters, must be a *Styela*, the presence or absence of a liver ceases to be a generic mark.

### **Polycarpa libera, Kiær.**

(Vide Kiær's description).

Found June 29th, 1877, in 68.21° N. Lat. and 10.40° E. Long. at a depth of 836 metres, with a temperature of —0.70° C.

### **Polycarpa pomaria, Savigny.**

(Pl. IV, fig. 27).

(With regard to synonyms and bibliography, I agree with Kiær).

It is in the shape of a truncated cone, the diameter of the base measuring about the same as the height, viz.

fastheftet med hele undersiden. Ingestionsaabningen sidder øverst, egestionsaabningen noget længere nede; begge er 4-lappede.

*Kappen* lys brunlig, sterkt rynket, især nederst og omkring aabningerne.

Mange, ugrenede *tentakler* om ingestionsaabningen.

*Gjællesækken* er krummet nederst og har paa hver side 4 tydelige folder, som konvergerer mod svælget. Saavel rygfolden som længderibberne er membraner, helrandede og krusede i kanten.

*Maven* er tydelig stribet paa sin forreste del, lang og bøiet, gaar jævnt over i tarmen, som stiger ret op. *Anus* er halvmaaneformig med mange smale lapper paa den indre bue, og færre, bredere paa den ydre.

*Generationsorganer* i gjennemsigtige hermaphroditiske polycarper, intimt forbundne med muskellaget.

Fundet den 16de juli 1877, ved 70.55° N. Br., 18.35° ø. L. paa et dyb af 196 m. med temperatur 5.09° C.

#### **Polycarpa comata, Alder.**

(Pl. IV, fig. 28, 29).

Næsten kugleformet med ca. 2 cm.s diameter.

*Kappen* er tynd, med lange heftettraade, hvormed den bedækker sig med sand.

*Aabningerne* paa korte, retractile siphoner; begge har 4 lapper. *Tentakler* lange, ugrenede, ca. 40 i antal

*Flimmerorganet* hesteskoformet.

*Gjællesækken* har 4 folder paa hver side, som konvergerer mod svælget; hver fold er dannet af 8—10 længderibber. Saavel disse som rygfolden er helrandede membraner, krusede i kanten. *Rygfolden* er bøiet til venstre og gaar ned paa venstre side af svælget. Mellem to længderibber er der ca. 6 stigmata.

*Oesophagus* kort og kantet; *maven* liden, valseformig med ca. 12 folder, ligger paa venstre side. *Tarmen* bøier straks horisontalt tilbage til dorsalsiden og stiger her ret op. Dens indre væg er bugtet ind og danner en rende. *Anus* er derfor halvmaaneformig; 5 lapper paa indre bue og 14 paa den ydre.

*Generationsorganer* i polycarper, som er ægformige, hermaphroditiske og løst fæstede til muskulaturen.

Den blev funden sammen med *Polycarpa pomaria*.

#### **Paramolgula arctica, nov. sp.**

(Pl. IV, fig. 30, 31 og 37).

Dette er en meget liden ascidie, kugleformet, med diameteren varierende fra 6—10 mm.

Den norske Nordhavsekspektion. Kristine Bonnevie: Ascidie simplices og ascidie compositae.

between 2 and 3 centim. It is attached by the entire under surface. The branchial orifice is the uppermost, the atrial somewhat lower: both are 4-lobed.

*The tunic* is of a light brown colour, very much wrinkled, especially below and round the apertures.

Numerous simple *tentacles* surround the branchial aperture.

*The branchial sac* is arched below, and has 4 distinct folds on each side converging towards the gullet. Both the dorsal lamina and the longitudinal bars are plain membranes with wavy edges.

*The stomach* is distinctly corrugated in the front part, is long and curved, merging gradually into the intestine, which ascends perpendicularly. *The anus* is crescent-shaped, with numerous small lobes on the inner curve, and fewer, broader ones on the outer.

*Generative organs* in transparent, hermaphroditic polycarps, closely connected with the muscle stratum.

Found on July 16th, 1877, in 70.55° N. Lat. and 18.35° E. Long. at a depth of 196 metres, with a temperature of 5.09° C.

#### **Polycarpa comata, Alder.**

(Pl. IV, figs. 28, 29).

Almost globular, with diameter of about 2 centim.

*The tunic* is thin with long attachment-fibres, by means of which the animal covers itself with sand.

*The apertures* are on short, retractile siphons and are both 4-lobed. *The tentacles* are long, not ramified, and are about 40 in number.

*The dorsal tubercle* is in the form of a horse-shoe.

*The branchial sac* has 4 folds on each side, converging towards the gullet. Each fold is composed of from 8 to 10 longitudinal bars. These, as well as the dorsal lamina, are plain membranes, curled at the edge. *The dorsal lamina* curves to the left, and descends on the left of the gullet. There are about 6 stigmata between two longitudinal bars.

*The oesophagus* is short and angular; *the stomach* is small and cylindrical, with about 12 folds, and lies on the left side. The intestine turns sharply in a horizontal direction back to the dorsal side, and thence ascends perpendicularly. Its inner wall bulges inwards, and forms a channel. *The anus* is therefore crescent-shaped, with 5 lobes on the inner curve, and 14 on the outer.

*Generative organs* in polycarps which are ovate, hermaphroditic and loosely attached to the musculature.

This species was found together with *P. pomaria*.

#### **Paramolgula arctica, nov. sp.**

(Pl. IV, figs. 30, 31 and 37).

This is a very small, globular Ascidian, its diameter varying from 6 to 10 millim.



*Kappen* er meget tynd og fuldstændig klar og gjen-nemsigtig; men den er bedækket med sand, dog ikke tæt-tere, end at man kan se lyset tvers igjennem den. Total-indtrykket af dyrets farve er, at det er sort; men ser man paa de enkelte sandkorn, som bedækker det, har disse forskjellig farve. Kun omkring aabningerne er kappen fæstet til dyret, og i kontraheret tilstand optar dette kun halvdelen af kappens volum og er sterkt sammentrykt fra siden.

*Aabningerne* sidder tæt ved hinanden paa oversiden, paa siphoner, som er ca. 1 mm lange og vel forsynede med muskulatur. Ingestionsaabningen har 6 lapper, eges-tionsaabningen 4. Ved basis af mundsiphonen er der en *tentakelkrans* med tentakler af 3 størrelser. 10 store af-veksler med ligemange af anden størrelse, medens 20 rudimentære halverer mellemrummene. Kun de største er sammensatte; de er lappede, af udseende som et egeblad; de øvrige er traadformede.

*Flimmerorganet* er bægerformigt, og nervegangliet er temmelig stort, aflangt.

*Gjællesækken* er uden folder paa siderne; *rygfolden* dannes af en noget bugtet membran. Paa indsiden af gjællesækken er et system af længde- og tverribber, der sammen danner store rektangulære felter, højere end brede. Længderibberne, 7 paa hver side, er membraner, som rager ind i gjællesækken. Gjællespalterne er ordnede i spiraler, som er fladtrykte fra siderne, saa at hele gjællesækken er sammensat af rektangulære felter, som dog ikke staar i nogen regelmæssig forbindelse med de felter, som dannes af længde- og tverribberne. Disse kan sees gennem spiraklerne, snart inde ved centrum af en spiral og snart ved periferien.

*Tarmkanalen* ligger paa venstre side af gjællesækken. *Anus* har to udboiede læber.

*Generationsorganer* findes paa begge sider, paa venstre side foran tarmslyngen.

Da denne art har gjællesæk uden folder og genera-tionsorganer paa begge sider, maa den regnes til slægten *Paramolgula*, *Traustedt*, som hidtil kun har indbefattet den ene art *Paramolgula Schulzii*, *Traustedt*.

Den blev funden den 1ste august 1877 ved Jan Mayn paa et dyb af 128 m. med temperatur  $\div 0.6^{\circ}$  C.

*The tunic* is very thin and perfectly clear and trans-parent; and although covered with sand, this still permits of the light being seen through it. The general impression received of the colour of the animal is that is black, but on looking at the individual grains of sand that cover it, they are seen to have various colours. The tunic is at-tached to the animal only round the apertures; and in its contracted state, the animal takes up only half the capacity of the tunic, and is much compressed at the sides.

*The apertures* are approximate on the upper surface, on siphons about 1 millim. in length and well furnished with muscles. The branchial aperture is 6-lobed, the atrial 4-lobed. On the base of the oral siphon there is a fringe of tentacles of 3 different sizes. Ten of the largest alter-nate with as many of the medium size, while 20 rudimen-tary tentacles divide the interspaces. Only the largest are composite, being in appearance lobed like an oak-leaf. The remainder are filiform.

*The dorsal tentacle* is cup-shaped, and the nerve ganglion rather large and oblong.

The sides of *the branchial sac* are not plicated; *the dorsal lamina* is formed of a somewhat wavy membrane. On the interior of the branchial sac there is a network of longitudinal and transverse bars, which together form large rectangular compartments, higher than they are broad. The longitudinal bars, 7 on each side, are membranes which project into the branchial sac. The branchial stig-mata are arranged in spirals which are compressed laterally, so that the whole of the branchial sac is composed of rectangular compartments, which, however, have no regular connection with the compartments formed by the longitudinal and transverse bars. The latter can be seen through the spiracles, now in the centre of a spiral, now at the periphery.

*The intestinal canal* lies to the left of the branchial sac. The anus has 2 outward-curving lips.

*The generative organs* are on both sides, on the left side in front of the loop of the intestine.

As this species has a branchial sac without folds, and generative organs on both sides, it must be classed in the family *Paramolgula*, *Traustedt*, which has hitherto contained only the one species, *P. Schulzii*, *Traustedt*.

Found on Aug. 1st, 1877, near Jan Mayen, at a depth of 128 metres; temperature, —  $0.6^{\circ}$  C.

## II. Ascidiae compositae.

Nordhavsexpeditionens materiale af sammensatte ascidier bestaar af 10 arter, som repræsenterer familierne: Botryllidae, Distomidae, Polyclinidae, Didemnidae og Polystyelidae.

Arterne er følgende:

Fam. *Botryllidae*: *Sarcobotrylloides aureum*, Sars.

Fam. *Distomidae*: *Distoma crystallinum*, Renier.

Fam. *Polyclinidae*: *Amaroucium mutabile*, Sars.

„ *subacutum*?, v. Drasche

*Synoicum turgens*, Phipps.

„ *incrustatum*, Huitfeldt.

Fam. *Didemnidae*: *Didemnum niveum*, Giard.

Fam. *Polystyelidae*: *Goodsiria coccinea*, Cunningham.

Foruden disse findes ogsaa to usikre arter af *Distoma*.

Blandt Huitfeldts „Norges Synascidier“ staar opført:

*Sarcobotrylloides aureum*,

*Distoma crystallinum*,

*Amaroucium mutabile*, og

*Synoicum incrustatum*.

Af Nordhavsexpeditionens exemplarer er *Distoma crystallinum* fundet ved Storeggen, *Sarcobotr. aureum* ved Spitsbergen; men for de to andres saavel som for flere af de øvrige arters vedkommende er fortegnelsen over findesteder gaaet tabt.

En art, *Amaroucium subacutum*, er fundet ved Reykjavik, *Synoicum turgens* ved Beeren Island og *Goodsiria coccinea* ved Spitsbergen.

For de arters vedkommende, som er beskrevne af Huitfeldt, henviser jeg blot til denne beskrivelse.

***Sarcobotrylloides aureum*, Sars.**

(Se Huitfeldt).

En liden koloni af denne art fandtes sammen med *Goodsiria coccinea* ved Spitsbergen.

## II. Ascidiae compositae.

The North Atlantic Expedition collection of Compound Ascidiae comprises 10 species, representing the families Botryllidae, Distomidae, Polyclinidae, Didemnidae and Polystyelidae.

The species are as follow:

Fam. *Botryllidae*: *Sarcobotrylloides aureum*, Sars.

„ *Distomidae*: *Distoma crystallinum*, Renier.

„ *Polyclinidae*: *Amaroucium mutabile*, Sars.

„ „ „ *subacutum*, v. Drasche.

„ „ *Synoicum turgens*, Phipps.

„ „ *incrustatum*, Huitfeldt.

„ *Didemnidae*: *Didemnum niveum*, Giard.

„ *Polystyelidae*, *Goodsiria coccinea*, Cunningham.

In addition to these, there are two uncertain species of *Distoma*.

In Huitfeldt's „Norwegian Synascidia“ there are mentioned:

*Sarcobotrylloides aureum*.

*Distoma crystallinum*,

*Amaroucium mutabile*, and

*Synoicum incrustatum*.

Of the North Atlantic Expedition's specimens, *Distoma crystallinum* was found at Storeggen, and *Sarcobotrylloides aureum* near Spitzbergen; but the memorandum of the places where the other two, and several of the remaining species were found, has been lost.

*Amaroucium subacutum* was found at Reykjavik, *Synoicum turgens* near Beeren Island, and *Goodsiria coccinea* near Spitzbergen.

With regard to the species described by Huitfeldt, the reader is referred to the paper by that author.

***Sarcobotrylloides aureum*, Sars.**

(Vide Huitfeldt).

A small colony of this species was found, together with *Goodsiria coccinea*, near Spitzbergen.



**Distoma crystallinum**, Renier.

(Se Huitfeldt).

En ægformet koloni, ca. 3 cm. høi og 2 cm. bred, blev fundet ved Storeggen.

**Amaroucium mutabile**, Sars.

(Se Huitfeldt).

En koloni, af størrelse som en stor nød, graaagtig med de enkelte individer synlige som lyse punkter inde i kolonien.

**Amaroucium subacutum(?)**, v. Drasche.

Kolonierne er uregelmæssig formede, som overtræk paa tang, 5—7 mm. tykke. Paa spiritusexemplarer er de graa, gjennemsigtige, noget incrusterede med sand, og de enkelte individer skinner igjennem, gule, opretstaaende, 2—3 mm. lange.

Systemerne er uregelmæssige.

*Ingestionsaabningen* er omgivet af 6 tænder; *egestionsaabningen* har en lang analtunge.

Der er 10—12 rækker af gjællespalter.

*Maven* har 5 langsgaaende, dybe folder.

*Postabdomen* er lang, ustilket og ofte tvundet.

Hvad koloniernes størrelse angaar, afviger denne art betydelig fra *Am. subacutum* og den burde maaske opføres som en ny art; men da konserveringen ikke tilsteder nogen mere indgaaende undersøgelse af de enkelte individers anatomi, anser jeg det for rigtigst at henføre den til denne art, som den i hvert fald viser stor lighed med.

Flere kolonier af den blev fundet ved Reykjavik.

**Synoicum turgens**, Phipps.

(Pl. IV, fig. 36).

En levende koloni af denne art er afbildet af professor *G. O. Sars* i naturlig størrelse (Pl. II, fig. 36). Den har en temmelig frisk gul farve.

Den blev fundet den 4de juli 1878 ved 74,10° N. Br., 18,51° ø. L., paa et dyb af 64 m. med temperatur 1,1° C.

**Synoicum incrustatum**, Huitfeldt.

(Se Huitfeldt).

Af denne art fandtes flere cylinderformede kolonier, med diameter, lig høide, varierende mellem 0.5 cm. og 1 cm. *Cormus* er graa og gjennemsigtig. *Siderne* er riflede

**Distoma crystallinum**, Renier.

(Vide Huitfeldt).

An egg-shaped colony, about 3 cm. high and 2 cm. broad, was found at Storeggen.

**Amaroucium mutabile**, Sars.

(Vide Huitfeldt).

A colony, about the size of a large hazel-nut, greyish in colour, with the individual animals appearing as light spots within the colony.

**Amaroucium subacutum(?)**, v. Drasche.

The colonies are irregularly formed, investing seaweed, from 5 to 7 millim. thick. Spirit specimens are grey, and transparent, somewhat incrustated with sand, and the individual animals are seen through in a vertical position, from 2 to 3 millim. in height, and of a yellow colour.

The systems are irregular.

The *branchial orifice* is surrounded by 6 teeth; the *atrial* has a long anal languet.

There are from 10 to 12 rows of branchial stigmata.

The *stomach* has 5 deep longitudinal folds.

The *post-abdomen* is long, sessile and often twisted.

With regard to the size of the colonies, this species differs considerably from *A. subacutum*, and ought perhaps to be classed as a new species; but as the state of preservation does not allow of any minute examination of the anatomy of the individual specimens, I consider it best to include it in this species, as there is at all events a great similarity between them.

Several colonies were found at Reykjavik.

**Synoicum turgens**, Phipps.

(Pl. IV, fig. 36).

The fig. is drawn by Prof. *G. O. Sars* from a living colony of this species, the natural size. The specimen is of a rather bright yellow colour.

It was found on July 4th, 1878 in 74,10° N. Lat. and 18,51° E. Long. at a depth of 64 metres, with a temperature of 1,1° C.

**Synoicum incrustatum**, Huitfeldt.

(Vide Huitfeldt).

There were several cylindrical colonies of this species, with the diameter equal to the height, varying between 0.5 centim. and 1 centim. The *cormus* is grey and transparent.

paa langs, og paa overfladen er der smaa forhøiinger, svarende til hvert individ; disse sees igjennem, hvide opretstaaende.

#### **Didemnum niveum; Giard.**

*Cormus* er melkehvid,  $\frac{1}{2}$ —1 cm. tyk, findes som overtræk paa tang og koraller. Overfladen er ujevn, da den bugter sig ud omkring hvert individs ingestionsaabning. Stjerneformige kalkspicula er udbredt overalt, men i overveiende mængde langs koloniens overflade.

Individerne sidder i et enkelt lag langs overfladen og lodret paa denne.

*Ing. aabningen* har 6 lapper.

3 rækker gjællespalter findes. Overgangen fra thorax til abdomen er meget trang, og den skjules næsten af en kugleformig ansamling af kalkspicula paa dorsalsiden. Nedenfor udbreder abdomen sig til et volum, flere gange saa stort som thorax.

*Maven* er glat. *Vas deferens* gjør 7—8 slyngninger om testikelen.

Flere larver findes liggende i cormus, inden for det overfladiske lag.

The sides are corrugated longitudinally, and there are small prominences on the upper surface, corresponding to the individual members, which are in a vertical position, and shine through white.

#### **Didemnum niveum, Giard.**

The *cormus* is of a milky white colour, from  $\frac{1}{2}$  to 1 centim. thick. It is found covering seaweed and corals. The surface is uneven, as it bulges out round the branchial orifice of each animal. Stellate calcareous spicules are scattered all over, most thickly along the upper surface of the colony.

The separate members lie in a single layer along the upper surface, and perpendicular to it.

The *branchial orifice* is 6-lobed.

There are 3 rows of branchial stigmata. The transition from the thorax to the abdomen is very narrow, and almost hidden by a globular accumulation of calcareous spicules on the dorsal side. Below, the abdomen expands to a bulk several times as large as that of the thorax.

The *stomach* is smooth. The *vas deferens* makes 7 or 8 windings round the testicle.

Several larvæ are lying in the test, below the superficial stratum.

#### **Goodsiria coccinea, Cunningham.**

(Pl. IV, fig. 32—34).

Syn. *Goodsiria borealis*, Gottschaldt?

Af denne art blev der paa to forskellige stationer fundet en del kolonier, som varierer meget i størrelse. Den største af kolonierne er afbildet af professor G. O. Sars i naturlig størrelse (fig. 32 a). Den største udstrækning af ellipserne paa overfladen af denne varierer mellem 3 mm og 10 mm, medens afstanden mellem aabningerne er temmelig konstant, 2—3 mm.

De øvrige kolonier er mindre, lige ned til en, som kun bestod af to individer, ca. 5 mm paa hver kant.

Farven er paa levende kolonier gulrød, paa spiritus-eksemplarer graa med blaaligt skjær.

Begge *aabninger* har 4 lapper, som ikke er lige store. *Tentaklerne* om ingestionsaabningen er lange, traadformige, ca. 40 i antal. Omkring ingestionsaabningen findes ogsaa en række meget smaa, enkle tentakler.

*Flimmergruben* er bægerformig, og nervegangliet er beliggende et stykke bag denne; det er aflangt.

*Gjællesækken* er uden folder paa siderne; *rygfolden* er en foldet, helrandet membran, temmelig bred. Saavel længderibberne (4 paa hver side) som tverribberne er membraner. De deler gjællesækken i lave rektangler med 5—6 stigmata i hvert. Feldtet nærmest rygfolden er noget bredere end de øvrige.

#### **Goodsiria coccinea, Cunningham.**

(Pl. IV, figs. 32—34).

Syn. *Goodsiria borealis*, Gottschaldt?

A few colonies of this species were found at two different stations, varying greatly in size. The largest of the colonies has been figured by Prof. G. O. Sars, the natural size (fig. 32 a). The greatest extent of the ellipses on its surface varies between 3 and 10 millim., while the distance between the apertures is generally constant, viz. 2 or 3 millim.

The other colonies are smaller, one consisting of only 2 members, each edge measuring about 5 millim.

In the living colony the colour is a yellowish red, in preserved specimens it is grey with a bluish tinge.

Both the *apertures* have 4 lobes, which are unequal in size. The *tentacles* round the oral orifice are long and filiform, numbering about 40. There is also a fringe of very small simple tentacles round the atrial orifice.

The *dorsal tubercle* is cup-shaped, and the nerve ganglion, which is oblong, is situated a little behind it.

The *branchial sac* has no folds on the sides; the *dorsal lamina* is a folded, rather broad, plain membrane. Both the longitudinal bars (4 on each side) and the transverse bars are membranes. They divide the branchial sac into low rectangles, with 5 or 6 stigmata in each. The compartment nearest to the dorsal lamina is rather broader than the others.



*Oesophagus* er meget vid, boiet, længer end maven, som er næsten kugleformet med 10 dybe folder. Den er forsynet med lever. Tarmen gjør først en bue forover og boier derpaa paa venstre side af gjællsækken horisontalt over til den dorsale side, hvor den stiger ret op. *Anus* er helrandet med udoverbøiet kant.

*Generationsorganer* findes i smaa polycarper i muskel-laget.

Størrelsen af ellipserne paa overfladen afviger fra de tal, Herdman har opgivet for *Goodsiria coccinea*, endnu mer end det er tilfælde med *G. borealis*, Gottschaldt. Men da variationerne er saa betydelige inden en enkelt koloni, som ovenfor anført, og da Herdman udtrykkelig anfører, at tallene ikke maa betragtes som almindelige, anser jeg det ikke for rimeligt at grunde nogen ny art paa denne basis.

Kolonier af denne art blev fundne: den 7de juli 1878 ved 72.27° N. Br., 20.51° Ø. L. paa et dyb af 349 m. med temperatur 3.5° C. og den 5te aug. 1878 ved 76.19° N. Br., 15.42° Ø. L. paa et dyb af 128 m. med temperatur 0.44° C.

#### Literatur.

Udenfor den af Kiær og Huitfeldt anførte litteratur har jeg til mine undersøgelser væsentlig benyttet:

*Kiær, Johan*: Oversigt over Norges Ascidæ simplices.

*Herdman, W. A.*: Notes on British Tunicata. (The Journ. of Linnean Soc. Zoology. Vol. 24. 1893).

*Gottschaldt*: Die Synascidien der Bremerexpedition nach Spitzbergen. (Jen. Zeitschr. Bd. 28. 1894).

*Heiden, H.*: Ascidæ aggregatæ und Ascidæ compositæ von der Insel Menorca. (Zool. Jahrb. Abth. f. Systematik etc. 7 Bd. 3 H. 1893).

The *oesophagus* is very wide, flexed, and longer than the stomach, which is almost globular, with 10 deep folds. It is furnished with a liver. The intestine first makes a bend in front, then turns to the left of the branchial sac horizontally over to the dorsal side, where it ascends vertically. The anus is plain, with the margin bent outwards.

The *generative organs* are found in small polycarps in the muscular stratum.

The size of the ellipses on the surface differs from the figures given by Herdman for *Goodsiria coccinea*, even more than is the case with *G. borealis*, Gottschaldt; but as there is such considerable variation in a single colony, as mentioned above, and as Herdman expressly states that these figures must not be regarded as general, I see no reason for establishing a new species on this basis.

Colonies of this species were found on July 7th, 1878, in 72.27° N. Lat. and 20.51° E. Long. at a depth of 349 metres, with a temperature of 3.5° C.; and on Aug. 5th, 1878, in 76.19° N. Lat. and 15.42° E. Long. at a depth of 128 metres, with a temperature of 0.44° C.

#### Bibliography.

In addition to the above-mentioned works by Kiær, and Huitfeldt, I have principally used in my investigations:

*Kiær, Johan*: Oversigt over Norges Ascidæ simplices.

*Herdman, W. A.*: Notes on British Tunicata. (Journ. of Linnean Society. Zoology. Vol. 24. 1893).

*Gottschaldt*: Die Synascidien der Bremerexpedition nach Spitzbergen (Jen. Zeitschr. Bd. 28. 1894).

*Heiden, H.*: Ascidæ aggregatæ und Ascidæ compositæ von der Insel Minorca. (Zool. Jahrb. Abth. f. Systematik, etc. 7 Bd. 3 H. 1893).

## Forklaring til figurerne.

For samtlige figurer gjælder følgende betegnelser: t = tentakler, ms = muskulatur; f = flimmersøm, fl = flimmerorgan, ng = nerveganglion, n = nervetraad, r = rygfold, lr. = længderibber; tv.r. = tverribber, st. = stigmata, oe = oesophagus, m = mave, l = lever, ta = tarm, ov = ovarium, sp = spermasekke.

### Plade III.

- Fig. 1 *Ciona gelatinosa*. Nat. st. Udført af prof. Sars efter levende individ.  
 „ 2—3 *Ascidella patula*. Nat. st.  
 „ 4 do. do. Flimmersøm og flimmergrube. Oc. 1, Obj. 3.  
 „ 5 *Styela rustica?* Nat. st. Udført af prof. Sars efter levende individ.  
 „ 6 *Styela bathybia*. Nat. st.  
 „ 7 Den samme. Parti af tentakelkransen om ing. aabn. Oc. 1, Obj. 1.  
 „ 8 *Styela bathybia*. Stykke af rygfolden, samme forst. som fig. 7.  
 „ 9 *Styela bathybia*. Stykke af gjællesækken, forreste feldt paa høire side, viser fjerde og 5te fold, IV. og V. Oc. 4, Obj. 1.  
 „ 10 *Styela bathybia*. Regelmæssigt stykke af gjællesækken.  
 „ 11 *Styela bathybia*. Anus  
 „ 12 do. do. Generationsorg. paa høire side.  
 „ 13 do. do. do. paa venstre side.  
 „ 14 Snit gennem gen. org. paa høire side. Oc. 1, Obj. 3.  
 „ 15 *Styela cylindriformis*. Nat. st.  
 „ 16 Parti af den samme, som viser tentaklerne, flimmerorg. og det øverste af gjællesækken. Oc. 1, Obj. 1.  
 „ 17 Den samme, stykke af gjællesækken. Oc. 4, Obj. 1.  
 „ 18 Den samme. Maven, forstørret.

## Explanation of the Figures.

The following abbreviations are employed in all the figures: t = tentacles, ms = musculature, f = peripharyngeal band, fl = dorsal tubercle, ng = nerve ganglion, n = nerve-fibre, r = dorsal lamina, lr = longitudinal bars, tv.r = transverse bars, st = stigmata, oe = œsophagus, m = stomach, l = liver, ta = intestine, ov = ovary, sp. = sperm-cells.

### Plate III.

- Fig. 1 *Ciona gelatinosa*. Natural size. Drawn by Prof. Sars from a living specimen.  
 „ 2 *Ascidella patula*. Natural size.  
 „ 3 do. do.  
 „ 4 do. do. Peripharyngeal band, and dorsal tubercle. Oc. 1, Obj. 3.  
 „ 5 *Styela rustica(?)* Nat. size. Drawn by Prof. Sars from a living specimen.  
 „ 6 *Styela bathybia*. Nat. size.  
 „ 7 do. do. Part of the tentacular fringe round the branchial orifice. Oc. 1, Obj. 1.  
 „ 8 *Styela bathybia*. Part of the dorsal lamina, magnified with the same power as fig. 7.  
 „ 9 *Styela bathybia*. Part of the branchial sac, the foremost compartment on the right side showing the fourth and fifth folds, IV. and V. Oc. 4, Obj. 1.  
 „ 10 *Styela bathybia*. A regular piece of the branchial sac.  
 „ 11 *Styela bathybia*. Anus.  
 „ 12 do. do. Generative organ on right side.  
 „ 13 do. do. do. do. on left side.  
 „ 14 do. do. Section of right generative organ.  
 „ 15 *Styela cylindriformis*. Nat size.  
 „ 16 Portion of the same, showing tentacles, dorsal tubercle, and the upper part of the branchial sac. Oc. 1, Obj. 1.  
 „ 17 The same; portion of branchial sac. Oc. 4, Obj. 1.  
 „ 18 The same; stomach, enlarged.



## Plade IV.

- Fig. 19 *Styela uniplicata*, nat. st.  
 „ 20 do. do. Tentakler og flimmerorgan.  
 Oc. 1, Obj. 1.  
 „ 21 *Styela uniplicata*. Parti af gjællesækken med  
 rygfolden og de dybe folder paa siderne, seet  
 indenfra. Den bagerste, sammentrængte del er  
 bøiet til siden og viser sig som en skygge under  
 gjællesækken. Oc. 1, Obj. 1.  
 „ 22 *Styela uniplicata*. Regelmæssigt parti af gjælle-  
 sækken. Oc. 4, Obj. 1.  
 „ 23 *Styela uniplicata*. Parti af tarmkanalen.  
 „ 24 do. do. Anus.  
 „ 25 do. do. Generationsorgan.  
 „ 26 do. do. var. *minuta*, nat. st.  
 „ 27 *Polycarpa pomaria*, nat. st.  
 „ 28 *Polycarpa comata*, nat. st.  
 „ 29 do. do. Anus.  
 „ 30 *Paramolgula arctica*, tentakler, flimmerorg. og  
 nerveganglion. Oc. 1, Obj. 1.  
 „ 31 *Paramolgula arctica*. Stykke af gjællesækken.  
 Oc. 4, Obj. 1.  
 „ 32 a og b. *Goodsiria coccinea*, a, nat. st., b, for-  
 størret. Udførte af prof. Sars efterlevende koloni.  
 „ 33 *Goodsiria coccinea*. Stykke af gjællesækken.  
 Oc. 4, Obj. 1.  
 „ 34 *Goodsiria coccinea*. Stykke af tarmkanalen.  
 „ 35 *Distoma sp.(?)* nat. st.  
 „ 36 *Synœicum turgens*. Nat. st. Udført af prof.  
 Sars efter levende koloni.  
 „ 37 *Paramolgula arctica*, nat. st.

## Plate I.

- Fig. 19 *Styela uniplicata*. Nat. size.  
 „ 20 do. do. Tentacles and dorsal tubercle.  
 Oc. 1, Obj. 1.  
 „ 21 *Styela uniplicata*. Part of branchial sac with  
 dorsal lamina and deep folds at the side, as  
 seen from within. The hindmost compressed  
 portion is turned to one side, and appears like  
 a shadow beneath the branchial sac. Oc. 1,  
 Obj. 1.  
 „ 22 *Styela uniplicata*. A regular part of the bran-  
 chial sac. Oc. 4, Obj. 1.  
 „ 23 *Styela uniplicata*. Part of intestinal canal.  
 „ 24 do. do. Anus.  
 „ 25 do. do. Generative organs.  
 „ 26 do. do. var. *minuta*. Nat. size.  
 „ 27 *Polycarpa pomaria*. Nat. size.  
 „ 28 *Polycarpa comata*. Nat. size.  
 „ 29 do. do. Anus.  
 „ 30 *Paramolgula arctica*. Tentacles, dorsal tubercle  
 and nerve ganglion. Oc. 1, Obj. 1.  
 „ 31 *Paramolgula arctica*. Part of branchial sac.  
 Oc. 4, Obj. 1.  
 „ 32 a and b *Goodsiria coccinea*, a, nat. size; b, mag-  
 nified. Drawn by Prof. Sars from a living colony.  
 „ 33 *Goodsiria coccinea*. Part of branchial sac. Oc.  
 4, Obj. 1.  
 „ 34 *Goodsiria coccinea*. Part of intestinal canal.  
 „ 35 *Distoma sp.(?)* Nat. size.  
 „ 36 *Synœicum turgens*. Nat. size. Drawn by Prof.  
 Sars from a living colony.  
 „ 37 *Paramolgula arctica*. Nat. size.





DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

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ZOOLOGI.

FORTEGNELSE

OVER

NORGES

ASCIDIÆ SIMPLICES.

AF

JOHAN KIÆR.

MED 1 PLANCHE.



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CHRISTIANIA.

GRØNDAHL & SØNS BOGTRYKKERI.

—  
1896.

THE NORWEGIAN NORTH-ATLANTIC EXPEDITION

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BY

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WITH 1 PLATE.



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CHRISTIANIA.

PRINTED BY GRØNDAHL & SØN.

1896.





Den følgende fortegnelse er hovedsagelig kun et uddrag af mit tidligere arbejde, „Oversigt over Norges *Ascidiae simplices*“<sup>1)</sup>, hvortil henvises. De nye tillæg, jeg har kunnet gjøre, skyldes hr. stipendiat Huitfeldt-Kaas, som ifjor skrabede ved Nordland, Finmarken og i Trondhjemsfjorden og velvillig har overladt mig de indsamlede Monascidier til undersøgelse. Dette arktiske materiale frembød meget af interesse, og da der ogsaa i de par sidste aar er udkommet flere arbejder, der dels direkte behandler vor tunicatfauna dels faunaer, som staar vor meget nær, vil de følgende tillæg og bemærkninger ikke være uden interesse.

Jeg maa her faa lov til at udtale min tak til hr. professor R. Hertwig, paa hvis laboratorium min lille afhandling er udarbejdet, for hans interesse og hjælp, samt hrr. dr. Maas og stipendiat Huitfeldt-Kaas for deres beredvillige overladelse af de af dem indsamlede arktiske *Ascidiae simplices*.

München, 25de November 1895.

<sup>1)</sup> Christiania Vid. Selsk. Forhandl. 1893, No. 9, pag. 1—105, tab. I—IV.

The following list is principally only an extract from my earlier work, „Oversigt over Norges *Ascidiae simplices*“<sup>1)</sup> (A Survey of the *Ascidiae simplices* of Norway), to which the reader is referred. For the additions which I have been enabled to make, I am indebted to Mr. Huitfeldt-Kaas, who was dredging last year on the Nordland and Finmark coasts and in the Trondhjem Fjord, and who has kindly handed over to me for examination, the Monascidia then collected. This arctic material presented much that was of interest, and as, during the last few years, there have also appeared several works partly dealing directly with the Norwegian tunicate fauna partly with faunæ that are very nearly allied to the Norwegian, the following supplement and remarks will not be devoid of interest.

I must here be allowed to express my thanks to Professor R. Hertwig, in whose laboratory my little treatise has been prepared, for his interest and help; and also to Dr. Maas and Mr. Huitfeldt-Kaas for so readily submitting to me arctic *Ascidiae simplices* collected by them.

Munich, 25th November, 1895.

<sup>1)</sup> Christiania Vid. Selsk. Forhandl. 1893, No. 9, pp. 1—105, Pl. I—IV.

Mit forrige arbejde, „Oversigt over Norges Ascidiae simplices“, hvortil under de fleste arter er henvist, kaldes overalt kun „Oversigt“. Følgende fra 1893 udkomne arbejder er af særlig interesse for kjendskabet af Norges *Ascidiae simplices* og deres geografiske udbredelse og citeres i teksten i forkortet form:

*Herdman*, Notes on British Tunicata, II (Journal af Linnean Society, Zoology, vol. XXIV, 1894, pag. 431).

Især vigtig ved revision af de af Alder & Hancock beskrevne Ascidier samt hans bemærkninger til et par norske *Styela*-former.

*Jacobsohn*, Ueber d. Tunicaten d. weissen Meeres. (Travaux de la soc. d. Natural. d. St. Petersbourg. Sect. d. Zoolog. vol. XXIII, Petersb. 1892, pag. 156).

En kort fortegnelse med revision af Wagners arter; russisk tekst med kort tysk *résumé*.

*Norman*, A month on the Trondhjem Fiord. (Annals a Mag. af Nat. Hist. 6th Ser. vol. 12, 1893, pag. 443).

Resultatet af hans skrabninger i Trondhjemsfjorden. Herdman har bestemt Ascidierne og angiver 2 for vor fauna nye arter.

*Traustedt*, „Ascidiae simplices“ i „Det videnskabelige udbytte af kanonbaaden „Hauch's“ togter“. Bd. V. Kjobenh. 1893, pag. 309.

Kort fortegnelse over samtlige ved Danmark fundne *Ascidiae simplices*.

My previous work, „Oversigt over Norges Ascidiae simplices“, to which reference is made under most of the species, is in every case called only „Oversigt“. The following works, published since 1893 are of especial interest in making acquaintance with the Norwegian *Ascidiae simplices* and their geographical distribution, and are cited in the text in an abbreviated form.

*Herdman*, Notes on British Tunicata, II (Journal of Linnean Society, Zoology, Vol. XXIV, 1894, p. 431).

Especially important on account of the Ascidiae described by Alder and Hancock, and the author's remarks on a few Norwegian *Styela* forms.

*Jacobsohn*, Ueber d. Tunicaten d. weissen Meeres. (Travaux de la soc. d. Natural d. St. Pétersbourg. Sect. d. Zoolog. Vol. XXIII, Pétersb. 1892, p. 156).

A short list with a revision of Wagner's species; Russian text, with a short German *résumé*.

*Norman*, A Month on the Trondhjem Fjord. (Annals a Mag. of Nat. Hist. 6th Ser. Vol. 12, 1893, p. 443).

The result of dredgings in the Trondhjem Fjord. Herdman has determined the Ascidians, and gives 2 species new to the Norwegian fauna.

*Traustedt*, „Ascidiae simplices“ in „Det videnskabelige udbytte af Kanonbaaden „Hauch's“ togter“. Bd. V., Copenh. 1893, p. 309.

A short list of all *Ascidiae simplices* found on the coasts of Denmark.



## Fam. I. Ascidiae, Herdman.

### Ciona, Flem.

#### 1. *Ciona intestinalis*, Lin.

Traustedt, *Ascidiae simplices*, „Hauch“ V.  
Norman, A month on the Trondhjemsfjord.

Efter Herdmans sidste undersøgelser<sup>1)</sup> maa *Ciona fascicularis*, Hnk, opfattes som egen art; men da Herdman hverken omtaler eller afbilder kjonsorganer, synes det ikke udelukket, at det kun er unger af *Ciona intestinalis*, Lin.

Udbredelse: Ved Norge overalt yderst almindelig lige fra Christianiafjorden til Nordkap, ja ogsaa ved Østfinmarken, især paa *Zostera marina* og laminarier. Medens den ved det sydlige Norge synes at optræde kun paa ganske grundt vand (til ca. 20 m.) gaar den mod Nord dybere, 65—130 m. i Trondhjemsfjorden (Norman) og 165 m. i Karahavet (Traustedt).

### Ascidiella, Roule.

Jeg har i „Oversigt“ pag. 21 gjort opmærksom paa, at Roules slægt *Ascidiella*<sup>2)</sup> ikke danner nogen skarpt begrænset gruppe, og at af vore former *A. obliqua*, Ald. danner en overgang fra *Ascidiella* til *Ascidia*; hos denne form findes nemlig ingen postbuccal dorsalfold, og nervegangliet ligger tæt bag flimregruben, dog i større afstand end ringfurens bredde; derimod finder man store papiller paa krydsningspunkterne af ribberne og nyrekonglomeraterne findes kun i tarmvæggene. Hos *Ascidia venosa*, O. F. Müll., der af Herdman<sup>3)</sup> stilles under *Ascidiella*, danner nervegangliets beliggenhed den eneste lighed med denne slægt; afstanden er dog ogsaa her større end ringfurens bredde, ca. 0.5 mm. hos et 50 mm. høit exemplar (tab. V, fig. 2). *Venosa* har derimod en meget lang postbuccal dor-

<sup>1)</sup> W. A. Herdman, Notes on British Tunicata, II, pag. 441.

<sup>2)</sup> Roule, Recherches sur les Ascidies simples des côtes de Provence, I. Phallusiadées (Annales du Mus. d'hist. nat. de Marseille, Zoologie. Tom. II, Marseille 1884—85, pag. 590).

<sup>3)</sup> Herdman, Notes on British Tunicata, II, pag. 432.

## Fam. I. Ascidiae, Herdman.

### Ciona, Flem.

#### 1. *Ciona intestinalis*, Lin.

Traustedt, *Ascidiae simplices*, „Hauch“ V.  
Norman, A Month on the Trondhjem Fjord.

According to Herdman's last examination<sup>1)</sup>, *Ciona fascicularis*, Hnk, must be regarded as a separate species; but as that author gives neither description nor figures of the sexual organs, the possibility of its being the young of *Ciona intestinalis*, Lin. does not seem to be excluded.

Distribution. Very general along the whole Norwegian coast from the Christiania Fjord to the North Cape, and also in East Finmark, generally on *Zostera marina* and Laminaria. Whereas in southern Norway it seems to occur only in quite shallow water (up to about 20 m.) towards the north it goes deeper, viz. from 65 to 130 m. in the Trondhjem Fjord (Norman) and 165 m. in the Kara Sea (Traustedt).

### Ascidiella, Roule.

In „Oversigt“, p. 21, I drew attention to the fact that Roule's genus *Ascidiella*<sup>2)</sup> does not form any sharply-defined group, and that, among the Norwegian forms, *A. obliqua*, Ald. forms a transition from *Ascidiella* to *Ascidia*, for it possesses no post-buccal dorsal lamina, and the nerve-ganglion lies close behind the dorsal tubercle, the distance being, however, greater than the breadth of the peripharyngeal band. On the other hand, large papillae are found at the crossing of the bars, and kidney concretions only in the intestinal wall. In *Ascidia venosa*, O. F. Müll., which Herdman<sup>3)</sup> classes under *Ascidiella*, the situation of the nerve-ganglion forms the only resemblance to that genus; but the distance here too, is greater than the breadth of the peripharyngeal bands about 0.5 mm. in

<sup>1)</sup> W. A. Herdman, Notes on British Tunicata, II, p. 441.

<sup>2)</sup> Roule, Recherches sur les Ascidies simples des côtes de Provence, I. Phallusiadées (Annales du Mus. d'hist. nat. de Marseille, Zoologie. Tome II, Marseille, 1884—85, p. 590).

<sup>3)</sup> Herdman, Notes on British Tunicata, II, p. 432.

salfold (tab. V, fig. 1) og store papiller i gjællesækken, som har 3 tværribber af 2den orden mellem 2 af 1ste, altså ganske som de typiske *Ascidia*-arter. Herdman anfører, at gjællesækken mangler den almindelige fine foldning, som findes hos de typiske former saavel af *Ascidia* som *Ascidiella*. Hos de af mig undersøgte exemplarer var dog gjællesækken fint foldet, omend denne foldning ikke var saa stærk som almindelig. Som ovenfor nævnt taler kun nervegangliets beliggenhed for denne arts slægtskab med *Ascidiella*; dette afsvækkes dog ganske, naar man tager hensyn til, hvor variabelt dette forhold er hos *Ascidia*. Hos vore øvrige arter af denne slægt er afstanden hos *complanata*, Fabr. ca.  $\frac{1}{60}$  af kroppens længde (0.5 mm. hos et 29 mm. høit ex.), hos *gelatinosa*, Kiær og *longisiphonata*, Kiær  $\frac{1}{10}$ — $\frac{1}{12}$ , hos *conchilega*, O. F. Müll.  $\frac{1}{6}$  og endelig hos *mentula*, Lin. endnu mere. Hvis efter dette en grændse skulde trækkes, maatte det nærmest ske mellem *complanata* og *gelatinosa*; dog er *complanata* efter sin hele øvrige bygning en ægte *Ascidia*. Da de øvrige karakterer, Roule opstiller for *Ascidiella*, ogsaa varierer stærkt, bliver en grændse mellem de to slægter umulig at trække og vil altid blive unaturlig. Uagtet jeg derfor tror, at Roules slægt neppe kan opretholdes, har jeg foreløbig beholdt den, nærmest som en subgenus, for en gruppe meget nærstaaende former, der udmærker sig ved følgende 3 karakterer:

1. Nervegangliet næsten direkte over flimregruben.
2. Dorsalfolden standser ved svelget.
3. Papillerne i gjællesækken ganske eller næsten fuldstændigt reducerede.

Alle vore *Ascidiella*-arter er nær beslægtede. *A. virginea*, O. F. Müll. maa ansees som distinkt art; *A. patula*, O. F. Müll. staar derimod *aspersa*, O. F. Müll. saa nær, at dens berettigelse maaske er tvivlsom. *A. minuta*, Kiær og *expansa*, Kiær er ligeledes meget nær beslægtede med *aspersa*; men da jeg ikke har havt anledning til fornyet undersøgelse af dem, kan jeg endnu ikke afgjøre, hvorvidt deres foreløbige opstilling som nye arter er berettiget eller ikke.

## 2. *Ascidiella virginea*, O. F. Müll.

Herdman, Notes on British Tunicata, II, pag. 432, 440. Traustedt, *Ascidia simplices*, „Hauch“ V.

Udbredelse: Fundet et par steder ved sydkysten og vestlandet; ikke almindelig, mest paa sandbund, 25—100 m.

a specimen measuring 50 mm. in height (Pl. V., fig. 2). On the other hand, *venosa* has a very long post-buccal dorsal lamina (Pl. V, fig. 1), and large papillæ in the branchial sac, which has 3 transverse bars of the second order between 2 of the first, being thus exactly like the typical *Ascidia* species. Herdman states that the branchial sac is without the usual fine folds which are found in the typical forms both of *Ascidia* and *Ascidiella*. In the specimens examined by me, however, the branchial sac was finely folded, although this folding was not so marked as usual. As already mentioned, the position of the nerve-ganglion is the only indication of the relation of this species to *Ascidiella*; but this is altogether weakened when the variableness of that position in *Ascidia* is taken into consideration. Of the other Norwegian species of this genus, the distance in *complanata*, Fabr., is about  $\frac{1}{60}$  of the length of the body (0.5 mm. in a 29 mm. high specimen) in *gelatinosa*, Kiær, and *longisiphonata*, Kiær,  $\frac{1}{10}$  to  $\frac{1}{12}$ , in *conchilega*, O. F. Müll.  $\frac{1}{6}$ , and lastly, in *mentula*, Lin., still more. If, from this, a limit had to be drawn, it ought properly to be between *complanata* and *gelatinosa*, although *complanata*, judging from its structure in all other respects, is a true *Ascidia*. As the remaining characters given by Roule for *Ascidiella*, also vary considerably, it will be impossible and always unnatural to draw a boundary-line between the two genera. Notwithstanding my belief that Roule's genus can scarcely be maintained, I have for the present retained it, more immediately as a sub-genus, for a group of very nearly allied forms that are distinguished by the 3 following characters:

1. The nerve-ganglion is almost directly above the dorsal tubercle.
2. The dorsal lamina stops at the oesophagus.
3. The papillæ in the branchial sac are entirely or almost entirely reduced.

All the Norwegian species of *Ascidiella* are nearly related. *A. virginea*, O. F. Müll. must be regarded as a distinct species. *A. patula*, O. F. Müll., on the other hand, is so nearly allied to *aspersa*, O. F. Müll., that its legitimacy is perhaps doubtful. *A. minuta*, Kiær, and *expansa*, Kiær, are also very nearly related to *aspersa*; but as I have had no opportunity for renewed examination of them, I cannot yet determine how far their temporary classification as new species is justified.

## 2. *Ascidiella virginea*, O. F. Müll.

Herdman, Notes on British Tunicata, II, pp. 432, 440. Traustedt, *Ascidia simplices*, „Hauch“ V.

Distribution. Found in a few places on the south and west coasts; not common, generally on sandy bottom, depths of from 25 to 100 m.

### 3. *Ascidiella patula*, O. F. Müll.

O. F. Müllers *A. patula* (Zoologia Danica, vol. II, pag. 32, tab. 55, fig. 1) er efter afbildningen at domme vistnok = *A. aspersa*, O. F. Müll. Dog synes den form, der senere er beskrevet af Traustedt og Kupffer, at kunne ansees som en egen art.

Udbredelse: Sjælden ved Vestlandet.

### 4. *Ascidiella aspersa*, O. F. Müll.

(*Asc. aspersa* + *scabra*, autores.)

Herdman, Notes on British Tunicata, II, pag. 432 og 440. Traustedt, *Ascidiae simplices*, „Hauch“ V.

Udbredelse: Denne var almindeligste *Ascidiella*-form findes overalt ved sydkysten og Vestlandet i en mængde varieteter; ofte i mængde paa laminarier, *Zostera marina* etc. fra stranden — ca. 100 m. Nordenfor Trondhjemsfjorden er den ikke fundet.

### 5. *Ascidiella minuta*, Kier.

(Se „Oversigt“, pag. 26.)

Udbredelse: Kun fundet et sted ved Vestlandet.

### 6. *Ascidiella expansa*, Kier.

(Se „Oversigt“, pag. 26.)

Udbredelse: Kun fundet ved Bergen.

## *Ascidia*, Lin.

### 7. *Ascidia obliqua*, Alder.

*Ascidia compressa*, O. F. Müll. Norman, A month on the Trondhjemsfjord.

Herdman fremsætter i Norman, A month on the Trondhjemsfjord, den opfatning, at O. F. Müllers *A. compressa* er = Alders *obliqua*. Det er sandsynligt uden at det dog med nogen sikkerhed kan afgjøres. Det synes derfor bedst at beholde det kjendte navn *obliqua*. O. F. Müllers *prunum* er sandsynlig denne form; iethvertfald har jeg seet exemplarer af *obliqua* fra Christianiafjorden, der skuffende har lignet Müllers afbildninger.

Udbredelse: Meget almindelig fra Christianiafjorden til Tromsø om ikke længere mod nord paa 200—600 m. Efter M. Sars er den ved Drøbak meget almindelig paa større dyb, medens den efter mine egne undersøgelser ved Vestlandet er almindelig paa passende lokaliteter, fjeldbund paa 80 m. og mere, her i mængde sammen med *Polycarpa varians*, Sav. og *Ascidia mentula*, Lin.

### 3. *Ascidiella patula*, O. F. Müll.

Judging from the illustration, O. F. Müller's *Asc. patula* (Zoologia Danica, vol. II, p. 32, Pl. 55, fig. 1) must be the same, as his *A. aspersa*. It seems possible, however, to consider the form sub-sequently described by Kupffer and Traustedt, as a separate species.

Distribution. Rare, on the west coast.

### 4. *Ascidiella aspersa*, O. F. Müll.

(*Asc. aspersa* + *scabra*, autores.)

Herdman, Notes on British Tunicata, II, pp. 432, 440. Traustedt, *Ascidiae simplices*, „Hauch“ V.

Distribution. This, the commonest of the Norwegian *Ascidiella* forms, is found everywhere on the south and west coasts, in a great many varieties; often in great numbers on Laminaria, *Zostera marina*, etc. from the shore — about 100 m. It is not found farther north than the Trondhjem Fjord.

### 5. *Ascidiella minuta*, Kier.

(Vide „Oversigt“, p. 26.)

Distribution. Found in only one locality on the west coast.

### 6. *Ascidiella expansa*, Kier.

(Vide „Oversigt“, p. 26.)

Distribution. Found only at Bergen.

## *Ascidia*, Lin.

### 7. *Ascidia obliqua*, Alder.

*Ascidia compressa*, O. F. Müll. Norman, A Month on the Trondhjem Fjord.

In Norman's „A Month on the Trondhjem Fjord“, Herdman advances the view that O. F. Müllers's *A. compressa* is the same as Alder's *obliqua*. This is probable, although the question cannot be decided with any certainty. It therefore seems best to retain the familiar name *obliqua*. O. F. Müller's *prunum* is probably this form; I have at any rate, seen specimens of *obliqua* from the Christiania Fjord, which bore a striking resemblance to Müller's illustrations.

Distribution. Very common, from the Christiania Fjord to Tromsø, and even farther north at a depth of from 200—600 m. According to M. Sars, it is very common at Drøbak at considerable depths, while judging from my own investigations on the west coast, it is common in localities which suit it, rocky bottom with a depth of 80 m. or more, and then in great numbers together with *Polycarpa varians*, Sav. and *Ascidia mentula*, Lin.



8. *Ascidia gelatinosa*, Kiaer.

Se „Oversigt“, pag. 30, tab. I, fig. 1—5.

Da *A. plana*, Hnk, efter Herdmans sidste undersøgelser<sup>1)</sup> er en varietet af *A. mentula*, Lin., er min formodning om *gelatinosa*'s nære slægtskab med denne art feilagtig.

Udbredelse: ikke sjælden ved Vestlandet, 60—200 m. sten- og lerbund.

9. *Ascidia venosa*, O. F. Müll.

*Phallusia venosa*, Traustedt, *Ascidiae simplices*, „Hauch“, V. *Ascidiella venosa*, Herdman, Notes on British Tunicata, II, pag. 432.

— Norman, A month on the Trondhjemsfjord.

Herdman kommer i sine „Notise“ II til samme resultat som jeg („Oversigt“, pag. 35) angaaende O. F. Müllers *venosa*, nemlig at den af ham afbildede form sandsynlig er *mentula*, Lin. Herdman stiller *venosa* under slægten *Ascidiella*; jeg kan ikke være enig heri og har i mine bemærkninger til *Ascidiella* nærmere redegjort herfor (pag. 3).

Udbredelse: En af vore almindeligste ascidier fra Christianiafjorden til Trondhjemsfjorden, paa forskjelligartet, dog mest stenbund fra ca. 30—200 m. Almindeligere inde i fjorden end ude i havbrynet.

10. *Ascidia complanata*, Fabr.

Se mine bemærkninger til denne art i „Oversigt“, pag. 36, fig. 12.

Udbredelse: Almindelig ved Finmarken fra 75—115 m. Den er en af vore mest karakteristiske arktiske ascidier.

11. *Ascidia prunum*, O. F. Müll.

Staar den foregaaende meget nær, se „Oversigt“ pag. 38. O. F. Müllers *prunum* er sandsynlig = *A. obliqua*, Ald.; men da dette ikke med sikkerhed kan afgjøres bør den ved Kupffers beskrivelse fixerede form beholde dette navn.

Udbredelse: Fundet ved Vestlandet og Vestfinmarken, sjælden.

12. *Ascidia conchilega*, O. F. Müll.

*Ascidia plebeia*, Norman, A month on Trondhjemsfjord.

Se bemærkningerne i min „Oversigt“ pag. 39 og fig. 11.

Udbredelse: Meget almindelig ved syd- og vestkysten til Trondhjemsfjorden, ialmindelighed paa sand- eller stenbund, sjældnere paa tang, 15—200 m.

<sup>1)</sup> Herdman, Notes on British Tunicata, II, pag. 437.

8. *Ascidia gelatinosa*, Kiaer.

Vide „Oversigt“, p. 30. Pl. I, figs. 1—5.

As *A. plana*, Hnk, according to Herdman's latest investigations,<sup>1)</sup> is a variety of *A. mentula*, Lin., my supposition as to the close relationship of *gelatinosa* with that species is incorrect.

Distribution. Not uncommon on the west coast; depth, 60—200 m., stone and clay bottom.

9. *Ascidia venosa*, O. F. Müll.

*Phallusia venosa*, Traustedt, *Ascidiae simplices*, „Hauch“ V. *Ascidiella venosa*, Herdman, Notes on British Tunicata, II, p. 432.

— Norman, A Month on the Trondhjem Fjord.

Herdman, in his „Notes“, II, comes to the same conclusion as I do („Oversigt“, p. 35) with regard to O. F. Müller's *venosa*, namely, that the form figured by him is probably *mentula*, Lin. Herdman places *venosa*, under the genus *Ascidiella*. I cannot agree with him in this, and have more fully explained my reasons in my remarks on *Ascidiella* (p. 3).

Distribution. One of the most common Norwegian Ascidians from the Christiania to the Trondhjem Fjord, on various, but chiefly stony bottom: depth from about 30—200 m. More general in the fjords than on the open coast.

10. *Ascidia complanata*, Fabr.

See my remarks on this species in „Oversigt“, p. 36, fig. 12.

Distribution. Common in Finmark at depths of from 75 to 115 m. It is one of the most characteristic of the arctic Ascidians.

11. *Ascidia prunum*, O. F. Müll.

Is nearly related to the preceding; see „Oversigt“, p. 38. O. F. Müller's *prunum* is probably *A. obliqua*, Ald.; but as this cannot be proved with certainty, the form fixed by Kupffer's description ought to retain this name.

Distribution. Found on the west coast, and in West Finmark: rare.

12. *Ascidia conchilega*, O. F. Müll.

*Ascidia plebeia*, Norman, A Month on the Trondhjem Fjord.

See remarks in my „Oversigt“, p. 39, fig. 11.

Distribution. Very common on the south and west coasts as far as the Trondhjem Fjord, generally on sandy or stony bottom, less frequently on sea-weed: depth 15—200 m.

<sup>1)</sup> Herdman, Notes on British Tunicata, II, pag. 437.

13. *Ascidia mentula*, O. F. Müll.

*Phallusia mentula*, Traustedt, *Ascidiae simplices*, „Hauch“, V.

*Ascidia mentula*, Herdman, Notes on British Tunicata, II, pag. 437 eg 442.

Om denne forms store variabilitet se Herdman, op. cit.

Udbredelse: Denne vor almindeligste ascidie findes ved hele vor kyst lige til Havøsund, ofte i uhyre mængde, mest paa sand- og fjeldbund med algevegetation. 0—200 m.

14. *Ascidia longisiphonata*, Kiær.

Se „Oversigt“, p. 41, fig. 6—10.

Herdman har i sine „Notes on British Tunicata“ II (pag. 439, pl. XXXV, 1—7) givet en noiagtigere beskrivelse af Hnk's *producta*; af denne fremgaar, at Hancock's form antagelig ikke er identisk med den af Roule beskrevne, men staar nærmere *longisiphonata*; dog maa denne sidste opretholdes som egen art. *A. longisiphonata* har en stærkere muskulatur saavel paa høire side som især paa mundsiphonen, gjællesækken har bredere spirakler og færre i hver maske (2—3 mod 3—4), intermediære papiller mangler, ganske medens de synes ofte at optræde hos *producta*.

Udbredelse: Kun fundet i Kværnvigen ved Bergen, paa ca. 30 m.

**Corella**, Ald. & Hnk.15. *Corella parallelogramma*, O. F. Müll.

Traustedt, *Ascidiae simplices*, „Hauch“, V.

Norman, A month on Trondhjemsfjord.

Udbredelse: Ved Norges kyst forekommer denne vor smukkeste Ascidie meget almindelig fra Christianiafjorden til Trondhjemsfjorden, saavel inde i fjordene som ude i havbrynet. Nordenfor Trondhjemsfjorden bliver den sjældnere og ved Lofoten synes dens nordgrændse at være. 15—200 m.

**Chelyosoma**, Brod. & Sow.16. *Chelyosoma Macleayanum*, Brod. & Sow.

Jacobsohn, Tunicaten d. weissen Meeres.

Udbredelse: Kun fundet ved Tromsø, i Ramfjorden; 100 m. paa løse smaasten.

13. *Ascidia mentula*, O. F. Müll.

*Phallusia mentula*, Traustedt, *Ascidiae simplices*, „Hauch“, V.

*Ascidia mentula*, Herdman, Notes on British Tunicata, II, pp. 437 & 442.

With regard to the great variableness of this form, vide Herdman, op. cit.

Distribution. This, the commonest of the Norwegian *Ascidiae*, is found along the whole coast of Norway, as far as to Havøsund, often in vast numbers, generally on sandy and rocky bottom with a growth of algæ. Depth 0—200 m.

14. *Ascidia longisiphonata*, Kiær.

Vide „Oversigt“, p. 41, figs. 6—10.

Herdman, in his „Notes on British Tunicata, II (p. 439, Pl. XXXV, figs. 1—7) has given an exact description of Hnk's *producta*, from which it appears that Hancock's form is probably not indetical with that described by Roule, but more resembles *longisiphonata*. The latter must, however, be retained as a separate species. *A. longisiphonata* has a stronger musculature, both on the right side and on the oral siphon (particularly the latter), the branchial sac has broader spiracles and fewer in each mesh (2 or 3, as against 3 or 4), and intermediary papillæ are altogether absent, while they seem frequently to appear in *producta*.

Distribution. Found only in Kværnvigen, near Bergen; depth about 30 m.

**Corella**, Ald. and Hnk.15. *Corella parallelogramma*, O. F. Müll.

Traustedt, *Ascidiae simplices*. „Hauch“, V.

Norman, A Month on the Trondhjem Fjord.

Distribution. This, the most beautiful of the Norwegian *Ascidians*, occurs very frequently on the shores of Norway from the Christiania to the Trondhjem Fjord, both in the fjords and on the open coast. North of the Trondhjem Fjord, it is more rare, and its northern limit seems to be at Lofoten. Depth, 15—200 m.

**Chelyosoma**, Brod. & Sow.16. *Chelyosoma Macleayanum*, Brod. & Sow.

Jacobsohn, Tunicaten d. weissen Meeres.

Distribution. Found only at Tromsø, in the Ram Fjord; depth, 100 m. on loose shingle.

Fam. II. Cynthiidae, Lac. Dut.

**Pelonaia**, Forb. & Goods.

17. **Pelonaia corrugata**, Forbes.

Jacobsohn, Tunicaten des weissen Meeres.

Traustedt, Ascidiae simplices, „Hauch“, V.

Udbredelse: Sjælden, men langs hele kysten fra Christianiafjorden til Vadsø, 40—200 m., sand og lere.

**Styela**, Macleay.

18. **Styela Loveni**, M. Sars.

(= *C. rustica*, Kupffer og *St. aggregata*, Traust.).

*Styela aggregata*, Traustedt, Ascidiae simplices, „Hauch“, V.

Om denne arts synonymi se „Oversigt“, pag. 48.

Udbredelse: Almindelig langs hele kysten, iallefald til Hammerfest, ca. 50—400 m.

19. **Styela rustica**, Lin.

*Styela monoceros*, Herdman, Notice on British Tunicate, II, pag. 450, Pl. XXXVI, fig. 2.

*Polycarpa rustica*, Jacobsohn, Tunicaten des weissen Meeres.

— Traustedt, Ascidiae simplices, „Hauch“, V.

Jeg gjorde i mit forrige arbejde opmærksom paa, at *St. rustica* ikke som af Herdman (Revised Classif. of Tunicata, pag. 585) kunde stilles under *Polycarpa*. I sine „Notes on British Tunicata“ II (pag. 448) oplyser han, at den af ham som *rustica* anseede form antagelig var en *Polyc. glomerata*, Ald., iethvertfald ganske forskjellig fra den arktiske *Styela*, han i 1891 fandt ved Nordkap og som han nu betragter som Linne's *rustica*. Herdman's *rustica* er lig min *aggregata*, medens hans sammesteds beskrevne *monoceros*, Möll. efter min mening er en varietet af den form, Kupffer har beskrevet som *aggregata* og Traustedt som *rustica*. Traustedts opfatning synes mig rimeligst, hvilket jeg under næste art vil søge at bevise. Med hensyn til var. *monoceros*, Möll. har jeg seet „hornet“ paa alle stadier fra en skarp tornet spids til en but forhøjning eller kun en knude, varierende til form og størrelse. Ligesaa almindelig forekommer en form, som mangler „horn“, men hvis anatomi aldeles stemmer overens med var. *monoceros*. En god afbildning af kjønsorganerne findes i Wagners „Wirbellosen d. weissen Meeres“ (I, Tab. 15, fig. 10—11).

Udbredelse: Almindelig langs hele vor kyst paa forskjelligartet bund til ca. 80 m.

Fam. II. Cynthiidae, Lac. Dut.

**Pelonaia**, Forb. & Goods.

17. **Pelonaia corrugata**, Forbes.

Jacobsohn, Tunicaten des weissen Meeres.

Traustedt, Ascidiae simplices, „Hauch“, V.

Distribution. Rare, but along the whole coast from the Christiania Fjord to Vadsø. Depth, 40—200 m., on sand and clay.

**Styela**, Macleay.

18. **Styela Loveni**, M. Sars.

(= *C. rustica*, Kupffer, and *St. aggregata*, Traust.).

*Styela aggregata*, Traustedt, Ascidiae simplices, „Hauch“, V.

For the synonyma of this species, see „Oversigt“, p 48.

Distribution. General along the whole Norwegian coast, at least as far as Hammerfest. Depth, from about 50 to 400 m.

19. **Styela rustica**, Lin.

*Styela monoceros*, Herdman, Notes on British Tunicate, p. 450, Pl. XXXVI, fig. 2.

*Polycarpa rustica*, Jacobsohn, Tunicaten des weissen Meeres.

— Traustedt, Ascidiae simplices, „Hauch“, V.

In my former work, I drew attention to the fact that *St. rustica* could not be placed, as Herdman places it (Revised Classif. of Tunicata, p. 585), under *Polycarpa*. That author, in his „Notes on British Tunicata“, II, p. 448, states that the form which he considered to be *rustica*, was probably a *Polyc. glomerata*, Ald. and at any rate quite different from the arctic *Styela*, which he found in 1891 at the North Cape, and which he now considers to be Linnæus' *rustica*. Herdman's *rustica* resembles my *aggregata*, while his *monoceros*, Möll. described in the same work is, in my opinion, a variety of the form described by Kupffer as *aggregata*, and by Traustedt as *rustica*. Traustedt's view seems to me reasonable, as I will endeavour to prove in my remarks on the next species. As regards var. *monoceros*, Möll. I have seen the „horn“ in all stages, from a sharp, thorny point, to a blunt elevation or only a protuberance varying as to shape and size. One form, in which the „horn“ is absent, but whose anatomy is exactly similar to var. *monoceros*, is equally common. A good representation of the sexual organs will be found in Wagner's Wirbellosen d. weissen Meeres (I, Pl. 15, figs. 10, 11).

Distribution. General along the whole Norwegian coast on various bottoms, to a depth of about 80 m.



20. *Styela aggregata*, Rathke.

1806. *Ascidia aggregata*, J. Rathke. Zoologia Danica. Vol. IV, pag. 11, tab. 130, fig. 2.
1825. *Dendrodia glandaria*, Mac-Leay, Anatom. Observ. on Tunicata with descript. of 3 species coll. in Fox Channel during the late Northern Expedition. (The Transact. of Linnean Soc. of London. Vol. XIV, London, 1825, pag. 547, tab. XX, fig. 1—6).
1851. *Ascidia patula*, M. Sars, Reise i Lofoten og Finmarken. (Nyt Mag. f. Naturvid. Bd. VI, 1851, pag. 156).
1858. *Cynthia aggregata*, M. Sars, Bidrag til en skildring af den arktiske molluskfauna ved Norges nordlige kyst. (Forhandl. i Vidensk. Selsk. i Christiania, 1858, pag. 64).
1891. *Dendrodia glandaria*, M.-Leay, Herdman, A revis. Classif. of Tunicata. (Linnean Society's Journ. Zoology, Vol. 23, pag. 582).
1893. *Styela aggregata*, Kiær, Oversigt over Norges ascidiæ simplices. (Christ. Vidensk. Selsk. Forhandl. 1893, No. 9).
1893. *Styela rustica*, L. Herdman, Notes on British Tunicata, II (Linnean Society's Journ. Zool. Vol. 24, pag. 449, Pl. 36, 1).

Se „Oversigt“, pag. 49, fig. 14—19.

Herdman har i 1893 (op. cit.) fremsat sin opfatning af *St. rustica*, Lin., grundet paa studiet af det af ham i 1891 ved Finmarken indsamlede materiale. Han kommer til et andet resultat end Kupffer, Traustedt, Wagner og forfatteren, hvilket lettest vil sees af følgende tabellariske oversigt over den senere synonymi af de tre i dette spørgsmaal indviklede *Styela*-former.

	Kupffer. (1875)	Traustedt. (1880 og senere)	Wagner. (1885)	Kiær. (1893)	Herdman. (1893)
No. 1	<i>aggregata</i> , Rathke.	<i>rustica</i> , Lin.	<i>rustica</i> , Lin.	<i>rustica</i> , Lin.	<i>monoceros</i> , Möll.
No. 2				<i>aggregata</i> , Rathke.	<i>rustica</i> , Lin.
No. 3	<i>rustica</i> , Lin.	<i>aggregata</i> , Rathke.		<i>Loveni</i> , M. Sars.	

Disse tre former kan med lethed holdes fra hinanden ved tarmkanalens form og kjønsorganernes bygning, ja et eneste blik paa disse organer er nok til at vise, hvilken

20. *Styela aggregata*, Rathke.

1806. *Ascidia aggregata*, J. Rathke. Zoologia Danica, Vol. IV, p. 11, Pl. 130, fig. 2.
1825. *Dendrodia glandaria*, MacLeay, Anatom. Observ. on Tunicata, with Descript. of 3 species coll. in Fox Channel during the late Northern Expedition. (The Transact. of Linnean Soc. of London, Vol. XIV, London, 1825, p. 547, Pl. XX, figs. 1—6).
1851. *Ascidia patula*, M. Sars, Reise i Lofoten og Finmarken (Nyt Mag. f. Naturvid. Bd. VI, 1851, p. 156).
1858. *Cynthia aggregata*, M. Sars, Bidrag til en skildring af den arktiske molluskfauna ved Norges nordlige kyst. (Forhandl. i Vidensk. Selsk. i Christiania, 1858, p. 64).
1891. *Dendrodia glandaria*, Macleay, Herdman, A revis. Classif. of Tunicata (Linnean Society's Journ. Zoology, Vol. 23, p. 582).
1893. *Styela aggregata*, Kiær, Oversigt over Norges ascidiæ simplices (Christ. Vidensk. Selsk. Forhandl. 1893, No. 9).
1893. *Styela rustica*, L. Herdman, Notes on British Tunicata, II (Linnean Society's Journ. Zool. Vol. 24, p. 449, Pl. 36, fig. 1).

Vide „Oversigt“, p. 49, figs. 14—19.

In 1893, Herdman (op. cit.) stated his views with regard to *St. rustica*, Lin., based upon the study of specimens collected by him in Finmark in 1891. The conclusion he comes to is different to that arrived at by Kupffer, Traustedt, Wagner and the present writer, as will be easily seen from the following tabular survey of the later synonymy of the three forms of *Styela* involved in this question.

	Kupffer. (1875)	Traustedt. (1880 and later)	Wagner. (1885)	Kiær. (1893)	Herdman. (1893)
No. 1	<i>aggregata</i> , Rathke.	<i>rustica</i> , Lin.	<i>rustica</i> , Lin.	<i>rustica</i> , Lin.	<i>monoceros</i> , Möll.
No. 2				<i>aggregata</i> , Rathke.	<i>rustica</i> , Lin.
No. 3	<i>rustica</i> , Lin.	<i>aggregata</i> , Rathke.		<i>Loveni</i> , M. Sars.	

These three forms may be easily distinguished from one another by the shape of the intestinal canal and the structure of the sexual organs; indeed, one glance at these

form man har for sig.<sup>1)</sup> Naar vi saaledes efter vort nuværende kjendskab til dem med lethed kan igjenkjende dem, er det derimod vanskeligere med sikkerhed at identificere nogen af dem med Linné's *rustica*. Uagtet dette synonymisporgsmaal kan synes at være af liden betydning, er det dog nødvendigt at komme til klarhed og enighed herom, da ellers den fremtidige synonymi vil blive for broget. Jeg maa fastholde min tidligere opfatning som den rimeligste. Linné's korte diagnose af *rustica*: „*Ascidia scabra, ferruginea, aperturis incarnatis*“, er for svævende til at man kan komme til nogen sikkerhed om, hvilken form han har ment; han kjendte jo ogsaa kun den ene af dem. Efter hvad jeg har seet af de to former passer dog egenskaberne „*scabra*“ og „*ferruginea*“ bedst paa min *rustica*; den arktiske *Styela*, der har kjønnsorgan kun paa den ene side (min *aggregata*, R.) er oftest næsten glat paa sin øvre del og graagul; den kaldes af fiskerne potetes, et meget træffende navn<sup>2)</sup>; paa spiritusexemplarer er farven næsten altid lys graagul. Da som sagt tydningen af Linné's diagnose altid vil blive usikker, maa man rette sig efter O. F. Müllers „*Zoologia Danica*“, hvor begge former er beskrevet og afbildet paa en saadan maade, at de efter min mening med sikkerhed kan identificeres. *St. rustica* opfattes af Müller paa samme maade som af Traustedt og forfatteren. For lethedens skyld hidsættes her det vigtigste af beskrivelserne af *A. rustica* og *A. aggregata*:

<i>Ascidia rustica</i> , Lin. (Vol. I, pag. 11).	<i>Ascidia aggregata</i> , Rathke. (Vol. IV, fig. 11.)
<i>Ascidia scabra, ferruginea, aperturis incarnatis</i> , Linn. Syst. Nat. pag. 1087.	<i>Ascidia lævis, pallide incarnata, cylindrica, orificiis rubris</i> .
<i>Molluscum, coriaceum, adulta ætate, grossum, cylindraceum, lutescens, aliquantum sinuatum, utraque extremitate obtusum, rugis transversis, tuberculisque sparsis obsitum.</i>	<i>Ascidiam hanc minus frequentem e fundo maris prope Nordlandiam reportavit cel. Vahl. Siquidem nunquam solitariam semper vero plur, sæpius viginti ad triginta mediantibus radiculis tendiniis invicem junctas deprehenderit, eam aggregatam appellari voluit.</i>

<sup>1)</sup> Jeg vil her anføre de bedste beskrivelser af de 3 former:

For *St. aggregata*, Rathke: Kiær, „Oversigt“ pag. 49, fig. 14—19. Herdman, Notes on British Tunicata, II, pag. 449, pl. 36, fig. 1.

For *St. rustica*, Linné: Kupffer, „Tunicata“ i Jahresbericht der Commission zur wissenschaftl. Untersuch. d. deutsch. Meere in Kiel 1872—73. Berlin 1875, pag. 218. Traustedt, Die einfach. Ascid. d. Golfes v. Neapel. Mittheil. a. d. zoolog. Stat. zu Neapel, Bd. IV, 1883, pag. 48. Herdman, Notes on British Tunicata, II, pag. 450, tab. 36, fig. 2.

For *St. Loreni*, M. Sars: Kupffer, „Tunicata“ i Jahresbericht etc. pag. 215. Traustedt, Die einfach. Ascid. d. Golf. v. Neapel, pag. 480.

<sup>2)</sup> Meddelt mig af Dr. Maas.

organs is sufficient to show which is the form under observation.<sup>1)</sup> While we can thus, with our present acquaintance with them, easily recognise them, it is more difficult on the other hand with certainty to identify any of them with Linnæus' *rustica*. Although this question of synonyms may seem to be of little importance, it is necessary to come to an understanding and unity about it, as otherwise future synonyms will become too varied. I must maintain my earlier opinion as the most reasonable. Linnæus's short description of *rustica*: „*Ascidia scabra, ferruginea, aperturis incarnatis*“, is too vague to allow us to arrive at any certainty as to which form he meant: indeed he knew of only one. From what I have seen of the two forms, however, the qualities „*scabra*“ and „*ferruginea*“ apply best to my *rustica*. The arctic *Styela*, which has sexual organs only on the one side (my *aggregata*, R.) is generally almost smooth on the upper part, and of a grayish yellow colour: fishermen give it the very appropriate name of potato.<sup>2)</sup> In spirit specimens, it is almost always of a light grayish yellow. As, then, the interpretation of Linnæus' description will always remain uncertain, we must be regulated by O. F. Müller's „*Zoologia Danica*“, in which both forms are described and figured in such a way, that they can, in my opinion, be identified with certainty. Müller's view of *St. rustica* is the same as that of Traustedt and the present writer. To save trouble, the most important part of the description of *A. rustica* and *A. aggregata* is here quoted:

<i>Ascidia rustica</i> , Lin. (Vol. I, p. 14.)	<i>Ascidia aggregata</i> , Rathke. (Vol. IV, p. 11.)
<i>Ascidia scabra, ferruginea, aperturis incarnatis</i> , Linn. Syst. Nat. p. 1087.	<i>Ascidia lævis, pallide incarnata, cylindrica, orificiis rubris</i> .
<i>Molluscum coriaceum, adulta ætate grossum, cylindraceum, lutescens, aliquantum sinuatum, utraque extremitate obtusum, rugis transversis, tuberculisque sparsis obsitum.</i>	<i>Ascidiam hanc minus frequentem e fundo maris prope Norlandiam reportavit cel. Vahl. Siquidem nunquam solitariam semper vero plur, sæpius viginti ad triginta mediantibus radiculis tendiniis invicem junctas deprehenderit, eam aggregatam appellari voluit.</i>

<sup>1)</sup> I will here cite the best descriptions of the three forms:

Of *St. aggregata*, Rathke: Kiær, „Oversigt“ p. 49, figs. 14—19. Herdman, Notes on British Tunicata, II, p. 449, Pl. 36, fig. 1.

Of *St. rustica*, Linnæus: Kupffer, „Tunicata“ in Jahresbericht der Commission zur wissenschaftl. Untersuch. d. deutsch. Meere in Kiel, 1872—73. Berlin, 1875, p. 218. Traustedt, Die einfach. Ascid. d. Golfes v. Neapel. Mittheil. a. d. zoolog. Stat. zu Neapel, Bd. IV, 1883, p. 48. Herdman, Notes on British Tunicata, II, p. 450, Pl. 36, fig. 2.

Of *St. Loreni*, M. Sars: Kupffer, „Tunicata“ in Jahresbericht etc. p. 215. Traustedt, Die einfach. Ascid. d. Golf. v. Neapel, p. 480.

<sup>2)</sup> Imparted to me by Dr. Maas.



Den vortede, røde, solitære *rustica* stilles her i modsætning til den blegrode, glatte *aggregata*, der altid optræder i klaser paa 20—30 individer. Afbildningerne, der for sin tid er udmærkede, viser ogsaa tydeligt, at denne min opfatning er den rigtige.

Tab. 130, fig. 2 viser en typisk klase af *aggregata*, R. saaledes som jeg har seet dem i mængdevis fra Nordland og Finmarken, medens Tab. 15 viser solitære former, hvoraf fig. 3 stemmer særdeles godt overens med den af Traustedt og mig som *rustica*, Lin. opfattede *Styela*; jeg gjør her specielt opmærksom paa, at den nedre del af kappen er foldet paa tværs medens den øvre del er finere og grovere vortet. „Hornet“ er som jeg under *St. rustica* har anført, meget variabelt.

Naar saaledes Traustedts opfatning af *rustica*, Lin. maa ansees for den rigtige, og *A. aggregata*, Rathke er en arktisk *Styela* ikke kjendt af Traustedt, men først beskrevet af mig, maa folgelig den form, som Traustedt beskriver som *aggregata*, faa et andet navn og maa herefter hedde *Loveni*, M. Sars, brugt i 1851 om en med denne identisk *Styela*.<sup>1)</sup>

Udbredelse: Almindelig ved Lofoten og hele Finmarken, ofte i klynger paa 20—30 voxne individer, der ialmindelighed er mere eller mindre besat med unger. 40—80 m. paa stenbund.

## 21. *Styela grossularia*, v. Ben.

Jacobsohn, Die Tunikaten d. weissen Meeres.

Traustedt, *Ascidiae simplices*, „Hauch“, V.

Se min „Oversigt“ pag. 55.

Udbredelse: Almindelig ved syd- og vestkysten paa skjæl, stene, tang etc fra stranden — ca. 60 m. Nordenfor Trondhjemsfjorden er den endnu ikke paavist, uagtet den er almindelig i de arktiske have.

## Polycarpa, Heller.

Om slægten *Polycarpa* se „Oversigt“, pag. 56—59.

## 22. *Polycarpa pomaria*, Sav.

Norman, A month on Trondhjemsfjord.

Traustedt, *Ascidiae simplices*, „Hauch“, V.

Jacobsohn, Die Tunikaten d. weissen Meeres.

Udbredelse: Almindelig langs hele syd- og vestkysten op til Lofoten, hvor den er fundet af M. Sars. Ofte i mængde paa fjeldbund 100—200 m. I Trondhjemsfjord ved Rodberg paa 830 m. (Norman).

The red, warty, solitary *rustica* is here contrasted with the pink, smooth *aggregata*, which is always found in clusters of from 20 to 30 animals. The illustrations, which, for that period, are excellent, also show distinctly that my view is the correct one.

Pl. 130, fig. 2 shows a typical cluster of *aggregata*, R. such as I have seen in great numbers from Nordland and Finmark; while Pl. 15 shows solitary forms, of which that in fig. 3 agrees exceedingly well with the *Styela* held by Traustedt and myself to be *rustica*, Lin. I would here draw special attention to the fact that the lower part of the mantle is folded transversely, while the upper part is covered with large and small wart-like prominences. The „horn“, as I stated under *St. rustica*, is very variable.

As Traustedt's view of *rustica*, Lin. must thus be considered the correct one, and *A. aggregata*, Rathke is an arctic *Styela* with which Traustedt is not acquainted, and which I was the first to describe, it follows that the form described by Traustedt as *aggregata* must receive a new name, and be hereafter called *Loveni*, M. Sars, a name employed in 1851 to designate a *Styela* identical with this one.<sup>1)</sup>

Distribution. Common in Lofoten and the whole of Finmark, often in clusters of from 30 to 40 full-grown animals, which are generally more or less covered with young ones. Depth, 40—80 m., on stony bottom.

## 21. *Styela grossularia*, v. Ben.

Jacobsohn, Die Tunikaten d. weissen Meeres.

Traustedt, *Ascidiae simplices*, „Hauch“, V.

Vide my „Oversigt“, p. 55.

Distribution. General on the south and west coasts of Norway, on shells, stones, seaweed, etc. from the shore about 60 m. It has not yet been found north of the Trondhjem Fjord, although it is common in the arctic seas.

## Polycarpa, Heller.

For a description of the genus *Polycarpa*, se „Oversigt“, pp. 56—59.

## 22. *Polycarpa pomaria*, Sav.

Norman, A Month on the Trondhjem Fjord.

Traustedt, *Ascidiae simplices*, „Hauch“, V.

Jacobsohn, Die Tunikaten d. weissen Meeres.

Distribution. General along the whole south and west coasts of Norway, northwards as far as Lofoten where it was found by M. Sars. Frequently in great numbers on rocky bottom, depth, 100—200 m.; at Rodberg in the Trondhjem Fjord, at a depth of 830 m. (Norman).

<sup>1)</sup> M. Sars, Reise i Lofoten og Finmarken (Nyt Mag. f. Naturvid. Bd. 6, 1851).

<sup>1)</sup> M. Sars, Reise i Lofoten og Finmarken (Nyt Mag. f. Naturvid. Bd. 6, 1851).



**23. Polycarpa Finmarkiensis, Kier.**

Se „Oversigt“, pag. 60, fig. 20—25.

Udbredelse: Kun fundet ved Tromsø og Hammerfest.

**24. Polycarpa libera, Kier.**

Se „Oversigt“, pag. 62, fig. 26—30.

Udbredelse: Kun fundet i Komagfjord, Øxfjord og ved Vadsø.

**25. Polycarpa pusilla, Herdman.**

Herdman, Report on Tunicata etc. (Trans. Roy. Soc. Edinb. Vol. 32, 1887, pag. 224, Pl. 35, fig. 4—6).

Norman, A month on Trondhjemsfjord.

Udbredelse: Trondhjemsfjord ved Rødberg, 830—1000 m.

**Forbesella, Herdm.****26. Forbesella tessellata, Forb.**

Herdman, Notes on British Tunicata, II, pag. 451, Pl. 36, fig. 3—10.

Udbredelse: Almindelig langs vestkysten fra 40—200 m. Af MacAndrew &amp; Barrett angivet fundet nordenfor Trondhjemsfjorden; lokalitet nævnes ikke.

**Cynthia, Sav.****27. Cynthia echinata, Lin.**

Traustedt, Ascidiæ simplices, „Hauch“, V.

Jacobsohn, Die Tunicaten d. weissen Meeres.

Udbredelse: Almindelig ved hele vor kyst, 10—200 m.; ofte i mængde paa laminariestilke.

**28. Cynthia pyriformis, Rathke.***Cynthia papillosa*, Jacobsohn, Die Tunicaten d. weissen Meeres.Om dens slægtskab med *C. papillosa*, Lin. se „Oversigt“ pag. 67, fig. 35, 36. Herdman opstiller i „Revis. Classif. of Tunicata“<sup>1)</sup> følgende 3 nærstaaende arter: *Rhabdocynthia pyriformis*, Rathke, *Cynthia papillosa*, Lin. og *C. Nordensjöldii*, Wagn. Jeg har i mit forrige arbejde paavist, at *C. Nordensjöldii* er identisk med den norske<sup>1)</sup> Journ. of Linnean Soc. of Zoology. Bd. 23, 1891, pag. 575, 576, 577.**23. Polycarpa Finmarkiensis, Kier.**

Vide „Oversigt“, p. 60, figs. 20—25.

Distribution. Found only at Tromsø and Hammerfest.

**24. Polycarpa libera, Kier.**

Vide „Oversigt“, p. 62, figs. 26—30.

Distribution. Found only in Komag Fjord, Øx Fjord and at Vadsø.

**25. Polycarpa pusilla, Herdman.**

Herdman, Report on Tunicata, etc. (Trans. Roy. Soc. Edinb. Vol. 32, 1887, p. 224, Pl. 35, figs. 4—6).

Norman, A Month on the Trondhjem Fjord.

Distribution. The Trondhjem Fjord at Rødberg: depth, 830—1000 m.

**Forbesella, Herdm.****26. Forbesella tessellata, Forb.**

Herdman, Notes on British Tunicata, II, p. 451, Pl. 36, figs. 3—10.

Distribution. General along the west coast at depths of from 40—200 m. Stated by MacAndrew and Barrett to have been found north of the Trondhjem Fjord, locality not given.

**Cynthia, Sav.****27. Cynthia echinata, Lin.**

Traustedt, Ascidiæ simplices, „Hauch“, V.

Jacobsohn, Die Tunicaten d. weissen Meeres.

Distribution. General along the whole Norwegian coast at depths of from 10—200 m.; frequently in great numbers on Laminaria stalks.

**28. Cynthia pyriformis, Rathke.***Cynthia papillosa*, Jacobsohn, Die Tunicaten d. weissen Meeres.Concerning the relationship of this species to *C. papillosa*, Lin., vide „Oversigt“, p. 67, figs. 35, 36. Herdman, in his „Revised Classif. of Tunicata“,<sup>1)</sup> gives the three following, nearly-allied species: *Rhabdocynthia pyriformis*, Rathke, *Cynthia papillosa*, Lin. and *C. Nordensjöldii*, Wagn. In my previous work, I have shown that *C. Nordensjöldii*<sup>1)</sup> Journ. of Linnean Soc. of Zoology. Vol. 23, 1891, pp. 575, 576, 577.

form, som Rathke i 1806 har beskrevet og afbildet; denne art maa altsaa hede *pyriformis*. Da spicula ikke findes hos den norske *pyriformis*, er antagelig den pacifiske form en anden art og maa faa et andet navn. At adskille disse saa nærstaaende former ved at stille dem i 2 slægter synes mig noget kunstigt.

Udbredelse: Almindelig ved Finmarken og Lofoten i laminariebælte (20—40 m.) især paa nulliporer. Dens sydgrændse ca. 66—67° n. br. Rathke angiver at have fundet denne form ved Bergen.

### **Microcosmus, Heller.**

#### **29. *Microcosmus glacialis*, M. Sars.**

Se „Oversigt“, pag. 70, fig. 31—34.

Udbredelse: Havøsund, almindelig 80—100 m. (71° n. br.) Østeraat sjælden 200 m. (63° 40' n. br.) (M. Sars).

is identical with the Norwegian form which Rathke described and figured in 1806, so that this species must be called *pyriformis*. As spiculæ are not found in the Norwegian *pyriformis*; the Pacific form is probably another species, and must receive another name. To separate such nearly-allied forms by placing them in different genera, seems to me to be somewhat unnatural.

Distribution. General in Finmark and Lofoten in the Laminaria belt (20—40 m.) especially on nullipores. Its southern limit is about 66° or 67° N. Lat. Rathke states having found it at Bergen.

### **Microcosmus, Heller.**

#### **29. *Microcosmus glacialis*, M. Sars.**

Vide „Oversigt“, p. 70, figs. 31—34.

Distribution. Havøsund, common, 80—100 m. (71° N. Lat.); Østeraat, rare, 200 m. (63° 40' N. Lat.) (M. Sars).

## **Fam. III. Molgulidæ, Lac.-Duth.**

### **Molgula, Forb.**

#### **30. *Molgula crystallina*, H. P. C. Möll.**

Jacobsohn, Die Tunicaten d. weissen Meeres.

Se om slægten *Pera*, Stimps. „Oversigt“, pag. 74.

Udbredelse: Fundet ved Tromsø og Vadsø, 80—120 m., sandbund.

#### **31. *Molgula ampulloides*, v. Ben.**

Denne form har jeg med nogen tvivl henført til v. Benedens *ampulloides*, se „Oversigt“ pag. 75, fig. 41.

Udbredelse: Denne *Molgula* fandt forfatteren meget almindelig ved Sulenøerne udenfor Sogn, 20—40 m., sandbund. Nordenfor er den ikke paatruffet.

#### **32. *Molgula eugyroides*, Traust.**

Norman, A month on Trondhjemsfjord.

Udbredelse: Fundet af Norman ved Rødberg i Trondhjemsfjorden, paa 750—1000 m. Beskrevet af Traustedt fra Bahia, sydatlantiske ocean.

## **Fam. III. Molgulidæ, Lac.-Duth.**

### **Molgula, Forb.**

#### **30. *Molgula crystallina*, H. P. C. Möll.**

Jacobsohn, Die Tunicaten d. weissen Meeres.

Concerning the genus *Pera*, Stimps. vide „Oversigt“, p. 74.

Distribution. Found at Tromsø and Vadsø: depth, 80—120 m., sandy bottom.

#### **31. *Molgula ampulloides*, v. Ben.**

I have, with some hesitation, placed this form under v. Beneden's *ampulloides*: se „Oversigt“, p. 75, fig. 41.

Distribution. The present writer found this *Molgula* to be very common off the Sulen Islands, outside Sogn: depth, 20—40 m., sandy bottom. It has not been met with farther north.

#### **32. *Molgula eugyroides*, Traust.**

Norman, A Month on the Trondhjem Fjord.

Distribution. Found by Norman at Rødberg on the Trondhjem Fjord, at depths of from 750 to 1000 m. Described by Traustedt from Bahia in the South Atlantic Ocean.

33. *Molgula nana*, Kupff.

Traustedt, „Hauch“, V.

Udbredelse: Almindelig ved syd- og vestkysten, især paa laminariestilke, 20—50 m.

34. *Molgula occulta*, Kupff.

Jacobsohn, Die Tunicaten d. weissen Meeres.

Traustedt, „Hauch“, V.

Udbredelse: Vor almindeligste *Molgula* ved syd- og vestkysten, grov sandbund, 10—40 m.

35. *Molgula arctica*, nov. sp.

(Pl. V, fig. 3—7).

Beskrivelse. Dyret frit, næsten kuglerundt.

	Maal paa kappen.	Udtaget af kappen.
Høide . . . . .	13 mm.	10.5 mm.
Længde . . . . .	12.5 mm.	10 mm.
Afstand mellem siphonernes basis . . . . .		5 mm.

Kappen temmelig tyk, stiv, brunlig, dog gennemskinnende og ved hjælp af korte hæftetraade tæt bedækket med sand og skalfragmenter. Intet noget felt mellem aabningerne.

Siphonerne meget korte, men siddende meget langt fra hinanden (fig. 3).

Muskulaturen svag, kun siphonerne og deres nærmeste omgivelse med kraftigere muskler, der dog kun strækker sig et kort stykke nedover; mellem siphonerne løber to baand af korte tværmuskler, der begrænser et stort, aflangt, fuldstændigt muskelfrit felt, hvori gangliet ligger (fig. 3).

Feltet foran tentaklerne glat.

Tentaklerne ca. 14, afvekslende store og smaa, de større med faa og grove grene.

Flimregruben liden, pæreformet; aabningen svagt bøiet med den konkave side mod mundaabningen (fig. 6); det er dreiet over mod hoire.

Gangliet bagenfor og tilvenstre for flimregruben.

Ringfuren gjør ved flimregruben en ualmindelig lang og smal udbugtning.

Dorsalfolden helrandet, glat, standser ved svælg.

Gjællesækken med 7 svagt krummede og lidet udprægede folder paa hver side. Folderne har faa, men kraftige ribber (fra dorsalfolden: 4—5—5—4—4—3—2). Tværribberne kraftige. Kun 1 fladt infundibulum i hvert feldt; af og til i 5te fold og i 6te og 7de altid er infundibula delt i 2 mindre, og her ligger disse ikke altid under ribbe-komplekserne, men ofte fuldstændigt frit imellem dem (fig. 4).

33. *Molgula nana*, Kupff.

Traustedt, „Hauch“, V.

Distribution. General on the south and west coasts of Norway, most frequently on Laminaria stalks. Depth, 20—50 m.

34. *Molgula occulta*, Kupff.

Jacobsohn, Die Tunicaten d. weissen Meeres.

Traustedt, „Hauch“, V.

Distribution. The most common of Norwegian *Molgula* on the south and west coasts, on bottom of coarse sand: depth, 10—40 m.

35. *Molgula arctica*, nov. sp.

(Pl. V, figs. 3—7).

Description. Body unattached, almost globular.

	Measured outside tunic.	With tunic removed.
Height . . . . .	13 mm.	10.5 mm.
Length . . . . .	12.5 mm.	10 mm.
Distance between siphons at base . . . . .		5 mm.

The tunic is rather thick, stiff and of a brownish shade, though translucent. By the aid of short attachment filaments, it is thickly covered with sand and fragments of shell: no bare space between the orifices.

Siphons very short, but widely separated (fig. 3).

Musculature weak, only the siphons and immediate surroundings being furnished with strong muscles, which however extend for only a short distance downwards. Between the siphons run two bands of short transverse muscles, bounding a large, oblong space entirely without muscles, in which the ganglion lies (fig. 3).

Space in front of the tentacles, smooth.

Tentacles about 14 in number, alternately large and small, the larger ones with few and large rami.

Dorsal tubercle small, pyriform; opening slightly curved, with the concave side towards the oral aperture (fig. 6): it is twisted towards the right.

Ganglion behind and to the left of the dorsal tubercle.

By the dorsal tubercle, the peripharyngeal band makes an unusually long and narrow wave.

Dorsal lamina entire, smooth, ending at the œsophageal aperture.

Branchial sac with 7 slightly curved, and not strongly marked folds on each side. The folds have few but powerful bars (from the dorsal lamina: 4—5—5—4—4—3—2). Transverse bars strong. Only 1 flat infundibulum in each space. Now and then in the 5th fold, and always in the 6th and 7th, the infundibulum is divided into 2 smaller ones, and then they are not always situated beneath the



Udprægede folder findes saaledes kun i den dorsale del af gjællesækken. Spiraklerne forholdsvis lange, krummede og ordnede i udpræget spirale systemer, som er næsten regelmæssigt kvadratiske. Paa indsidene af gjællemembranen et uregelmæssigt radiert forløbende system af aarer som løber over spiraklerne og her ofte er forsynede med smaa processer, som især er talrige i de ventrale felter. Mellem dorsalfolden og 1ste dorsale fold paa høire side løber en enkelt ribbe.

Svelget langt nede i gjællesækken, omgivet af en fortykket læbe. Den lukkede tarmslynge boiet betydeligt opad (fig. 3). Anus trang med svagt firlappet rand.

Kjønnsorganer som sædvanlig paa begge sider, det venstre over tarmslyngen. Sædsækkene ligger i peripherien; paa nedsiden sees en større udførselsgang.

Nyresækken meget stor, stærkt boiet.

Talrige larver paatræffes i kloakrummet, alle med vel udviklet hale.

Systematiske bemærkninger. *M. arctica* ligner *occulta*, Kupff. i muskulaturens anordning, men skilles let fra denne ved gjællesækkens og flimregrubens enkle bygning. Gjællesækkens bygning minder om *M. siphonalis*, M. Sars.

Udbredelse. Kun fundet ved Gjesvæs (71° n. br.) af hr. stipendiat Huitfeldt-Kaas (1894).

### 36. *Molgula siphonalis*, M. Sars.

(Se „Oversigt“, pag. 77, fig. 37—40).

Udbredelse: Kun fundet ved Vadsø af M. Sars. 80—200 m.

### 37. *Molgula norvegica*, nov. sp.

(Pl. V, fig. 8—12).

Beskrivelse. Dyret synes ikke at have været fasthæftet.

	Maal paa kappen.	Udtaget af kappen.
Hoide . . . . .	19 mm.	13 mm.
Længde . . . . .	16 mm.	11.5 mm.
Afstand mellem siphonernes aabning . .	7 mm.	7 mm.
Afstand mellem siphonernes basis . . . .		2.5 mm.

Kappen tynd, men fast og tæt bedækket med sand og skalfragmenter (fig. 8).

Siphonerne ikke ganske retractile, mundsiphonen længst (fig. 9). Kroppen stærkt muskuløs; fra siphonerne, som er forsynede med kraftige indre længde- og ydre ring-

bar masses, but are often entirely free between them (fig. 4). Marked folds thus occur only in the dorsal part of the branchial sac. Spiracles comparatively long, curved, and arranged in pronounced spiral systems, which are almost regularly quadratic. On the inside of the branchial membrane, there is an irregularly radiating system of veins which run over the spiracles, and are there often furnished with small processes, which are especially numerous in the ventral spaces. Between the dorsal lamina and the first dorsal fold on the right side runs a single bar.

The oesophageal aperture is far down in the branchial sac, surrounded by a thickened lip. The closed intestinal loop is curved considerably upwards (fig. 3). Anus narrow, with a faint indication of 4 lobes in the margin.

Genital organs, as usual, on both sides, the left one above the loop of the intestine. The sperm cells lie in the periphery; on the inside, an excretory duct of considerable size is visible.

Renal sac very large, much curved.

Numerous larvæ were found in the cloacal cavity, all with well-developed tail.

Systematic Remarks. *M. arctica* resembles *occulta*, Kupff. in the arrangement of the musculature, but is easily distinguished from it by the simple structure of the branchial sac and the dorsal tubercle. The structure of the former recalls that of *M. siphonalis*, M. Sars.

Distribution. Found only at Gjesvær (71° N. Lat.), by Mr. Huitfeldt-Kaas (1894).

### 36. *Molgula siphonalis*, M. Sars.

(Vide „Oversigt“, p. 77, figs. 37—40).

Distribution. Found only at Vadsø, by M. Sars: depth, 80—200 m.

### 37. *Molgula norvegica*, nov. sp.

(Pl. V, figs. 8—12).

Description. The animal does not appear to have been attached.

	Measured outside tunic.	With tunic removed.
Height . . . . .	19 mm.	13 mm.
Length . . . . .	16 mm.	11.5 mm.
Distance between siphons at mouth . .	7 mm.	7 mm.
Distance between siphons at base . . . .		2.5 mm.

Tunic thin but firm, and thickly covered with sand and fragments of shell (fig. 8).

Siphons not quite retractile: mouth siphon the longer of the two (fig. 9). Body very muscular. The siphons are provided with powerful internal longitudinal, and ex-

muskler, løber de første ca. 5 mm. nedover straaformigt, medens de sidste findes i tæt lag mellem siphonerne og nedover ca. 3 mm. Mellem aabningerne sees et ganske lidet, mere muskelfrit felt, hvor gangliet ligger. Fra denne øvre, stærkt muskuløse del strækker sig talrige baand af korte muskler nedover kroppen. Den venstre side betydeligt rigere forsynet med disse end høire.

Tentaklerne 9 temmelig store, sammentrykte med ikke mange, men fine grene (fig. 11); 9 smaa imellem de store.

Flimregruben enkel, svagt opboiet; aabningen halvmaaneformig med den konkave side vendende noget bagud og tilvenstre (fig. 10).

Gangliet lidt tilvenstre for og delvis under flimregruben.

Dorsalfolden med glat rand, standser ved svelget.

Gjællesækken med 7 stærkt krummede høie folder paa hver side; 1ste til 5te fold fra dorsalfolden har 7—8 ribber, 6te 6 og 7de 5, hvoraf den ventrale ribbe er hoi, baandagtig. De to dorsale ribber er oftest løsere forbundne med folden og løber ialmindelighed i nogen afstand fra denne. Tværribberne fine og høie. Under ribberne findes i hvert felt 2 dybe infundibula, som i 6te og 7de fold atter deler sig i 2 mindre. Spiraklerne mellem foldene temmelig korte, rette eller svagt bøiede; de af disse og infundibula dannede spiralsystemer betydelig længre end brede. Over spiraklerne løber talrige anastomoserende aarer, som hist og her er forsynede med smaa knopformige ophøininger (fig. 12).

Svelget hoit oppe i gjællesækken (6 mm. fra flimregruben) og omgivet af en fortykket læbe. Tarmen danner en lukket, næsten horizontal slynge (fig. 9). Anus er trang, med svagt firedelt rand.

Kjønnsorganer store, især det høire (7 mm. langt); det venstre ligger over tarmslyngen. Begge er fint lappede med sædsække i randen, medens man paa nedsiden ser en lang, svagt grenet ovidukt, der mod kloakrummet aabner sig paa en fremspringende tap.

Nyresækken som sædvanlig under høire kjønnsorgan, svagt boiet.

Udbredelse. 1 exemplar fundet ved Gjesvær (71° n. br.) af hr. stipendiat Huitfeldt-Kaas (1894).

ternal circular muscles, the former of which radiate downwards from the siphons about 5 mm., while the latter are found in a thick layer between the siphons and downwards for about 3 mm. Between the apertures there is a very small, less muscular space in which the ganglion is situated. From the upper, more muscular part, numerous bands of short muscles extend downwards over the body, the left side being much more plentifully supplied with them than the right.

Tentacles 9 in number, rather large, compressed, with few, but fine rami (fig. 11). Nine smaller tentacles among the large ones.

Dorsal tubercle single, slightly bent upwards; the opening crescent-shaped, with the concave side turned somewhat backwards and to the left (fig. 10).

Ganglion a little to the left of, and partly below the dorsal tubercle.

Dorsal lamina with smooth margin; ends at the oesophageal aperture.

Branchial sac with 7 very much curved high folds on each side; the first 5 counting from the dorsal lamina, have 7 or 8 bars, the 6th has 6, and the 7th, 5, the ventral bars being high and ribbon-like. The 2 dorsal bars are generally more loosely attached to the fold, and usually run at some distance from it. The transverse bars are fine and high. Beneath the bars, in each space, there are two deep infundibula, which, in the 6th and 7th folds, again divide into 2 smaller ones. The spiracles between the folds are rather short and either straight or slightly bent; the length of the spiral systems formed by them and the infundibula, is considerably greater than the breadth. Above the spiracles run numerous anastomosing veins, provided here and there with small bud-like prominences (fig. 12).

The oesophageal aperture is high up in the branchial sac (6 mm. from the dorsal tubercle), and surrounded by a thickened lip. The intestine forms a closed, almost horizontal loop (fig. 9). The anus is narrow, with a slightly four-lobed margin.

Genital organs large, especially the right (7 mm. long); the left one is situated above the loop of the intestine. They are both finely lobed, with sperm cells in the margin, while on the inside, there is a long, slightly ramified oviduct, which opens towards the cloacal cavity upon a projecting process.

Renal sac, as usual, beneath the right genital organ, slightly curved.

Distribution. One specimen was found at Gjesvær (71° N. Lat.), by Mr. Huitfeldt-Kaas (1894).



**Paramolgula, Traust.**

38. **Paramolgula rara**, nov. sp.  
(Tab. V, fig. 16—19).

Beskrivelse. Dyret frit.

	Ydre maal.
Hoide . . . . .	8 mm.
Længde . . . . .	7 ..
Afstand mellem siphonernes spidse . . .	4 ..
Afstand mellem siphonernes basis . . .	2 ..

Kappen er tynd, vandklar, med faa hæftetraade og belagt med skjælfragmenter, uden at disse dog dækker hele kappen (fig. 16).

Siphonerne vel udviklede, temmelig fjernstaaende.

Hudmuskellaget kun ved siphonerne fæstet til kappen. Muskulaturen udviklet over hele kroppen, dog kun den øvre del forsynet med et udpræget netværk af ring- og længdemuskler.

Tentaklerne store, men næsten udelte, kun med smaa knopper, ca. 10 større.

Flimregruben meget liden, klokkeformig med vid aabning (fig. 18); den ligger over den venstre flimrebue.

Dorsalfolden meget kraftig og høi, med glat rand og standser pludselig ved svælget.

Gjællesækken grovbygget med 5 stærke længdebaand; bygningen og anordningen af spiraklerne stemmer fuldstændig overens med disse forhold hos *Eugyra translucida*, nov. sp. Se under denne! Infundibula kvadratiske (0.4—0.9 mm. brede) med 6—7 brede omgange (fig. 19). De er stærkt hævede, ja i de dorsale rækker saa stærkt kontraherede, at de minder om de stærkt udtrukne infundibula hos Traustedts slægt *Bostrichobranhus*. De i hveranden tværribbe begyndende spirakelender er svagt fortykkede og mindre bøiede end hos *Eugyra translucida*, nov. sp. 4 kraftige, radierende aarer i hvert infundibulum; intermediære optræder sjælden. Ingen spirakler mellem spiralsystemerne. I den ventrale længderække af infundibula er ikke hvert af disse opløst i to mindre.

Svælget i gjællesækkens nederste hjørne; tarmen er vid med stærkt opadstigende slynge (fig. 17). Anus er trompetformig udvidet med glat rand.

Kjønnsorganer udviklede paa begge sider, meget store (4 mm. lange og 3 mm. høie); det venstre ligger i tarmslyngen; de bestaar af en tæt, aflang krands af sække, hvis udførsels-gange løber ind mod midten, hvor vasa deferentia aabner sig paa 2—3 papiller, medens ovidukten løber op langs tarmen og munder ud 1 paa hver side i hoide med anus.

**Paramolgula, Traust.**

38. **Paramolgula rara**, nov. sp.  
(Pl. V, figs. 16—19).

Description. Body free.

	External measurement.
Height . . . . .	8 mm
Length . . . . .	7 ..
Distance between siphons at point . .	4 ..
Distance between siphons at base . . .	2 ..

Tunic thin, clear as water, with few attaching filaments, and covered, though not entirely, with fragments of shell (fig. 16).

Siphons well developed, rather distant.

The cuticular stratum is attached to the tunic only at the siphons. Musculature developed over the whole body, only the upper portion, however, being provided with a distinct network of circular and longitudinal muscles.

Tentacles large but almost unramified, only with small buds; about 10 larger ones.

Dorsal tubercle very small, bell-shaped, with wide opening (fig. 18); situated above the left peripharyngeal band.

Dorsal lamina very powerful and high, with smooth margin; ends suddenly at the œsophageal aperture.

Branchial sac of coarse build, with 5 strong longitudinal bands; the structure and arrangement of the spiracles agree exactly with those of *Eugyra translucida*, nov. sp. (See account of that species). Infundibula square (from 0.4 to 0.9 mm.) with 6 or 7 broad convolutions (fig. 19). They are very much raised, and in the dorsal rows so greatly contracted that they recall the widely projected infundibula in Traustedts genus *Bostrichobranhus*. The ends of the spiracles beginning in every alternate transverse bar, are slightly thickened and less curved than in *Eugyra translucida*, nov. sp. Four powerful, radiating veins in each infundibulum; intermediate ones seldom occur. No spiracles between the spiral systems. The infundibula in the ventral longitudinal row do not each divide into 2 smaller ones.

The œsophageal aperture is in the lowest corner of the branchial sac; intestine wide with a rapidly rising loop (fig. 17). Anus expanded in a trumpet shape, with smooth margin.

Genital organs developed on both sides, very large (4 mm. long, 3 mm. high); the left one situated in the loop of the intestine. They consist of a thick, oblong wreath of sacs whose excretory ducts run in towards the middle, where the vasa deferentia open upon 2 or 3 papillæ; while the oviducts run up along the intestine, and open one on each side, on a level with the anus.



Nyresæk tilstede, ligger paa høire side tæt ved maven.

Systematiske bemærkninger. Slægten *Paramolgula* er opstillet af Traustedt i 1885 paa en form fra Magellanstrædet, *P. Schulzii*.<sup>1)</sup> Aaret efter beskrev Drasche en *Eugyra symmetra*<sup>2)</sup> (arkt. & mediterr.), som maa regnes til samme slægt. Begge udmærker sig ligesom den nye norske art ved, at kjønsorganerne er udviklede paa begge sider af kroppen. Da ogsaa en nyresæk er tilstede (iethvertfald hos *P. symmetra* og *rara*), medens forøvrigt bygningen er som hos en typisk *Eugyra*, synes denne gruppe virkelig at danne en overgang mellem *Molgula* og *Eugyra*. Min art staar *P. symmetra* nær, adskilles dog let fra denne ved gjællesækkens, flimregrubens og tarmkanalens bygning.

Udbredelse. 1 exempl. fundet ved Bodø af hr. stipendiat Huitfeldt-Kaas (1894).

### *Eugyra*, Ald. & Hnk.

#### 39. *Eugyra glutinans*, H. P. C. Möll.

Traustedt, *Ascidæ simplices*, „Hauch“, V.

Jacobsen, *Die Tunicaten d. weissen Meeres*.

Udbredelse. Angives af Dr. Danielssen at være fundet ved Vadsø og forekommer isaafald langs hele vor kyst. Iethvertfald er den almindelig ved syd- og vestkysten, 15—40 m. sand og sølebund.

#### 40. *Eugyra translucida*, nov. sp.

(Tab. V, fig. 13—15).

Beskrivelse. Dyret frit, uden fasthæftningsflade, har maaske været fæstet til tang.

	Ydre maal.
Høide . . . . .	12 mm.
Længde . . . . .	11 ..
Afstand mellem siphonernes spidse . . .	2 ..

Kappen ganske tynd, vandklar, uden sand el. skalfragmenter og overalt fæstet til hudmuskellaget.

Siphonerne korte, ganske tætstillede.

Muskulaturen næsten kun udviklet paa den øvre del omkring aabningerne, hvor længde- og ringmusklerne danner et aabent netværk ned til tarmens øvre krumning.

<sup>1)</sup> Traustedt, *Asc. simplices* fra det stille ocean (vid. Meddel. fra d. naturh. forh. i Kjøbenhavn for 1884—86. Kjøbenh. 1884—87).

<sup>2)</sup> Drasche, „*Tunicata*“ i „*Die Oesterreichische Polarstat.* Jan Mayen. Beobachtungs ergebn.“ Bd. III, Pag. 101. Wien 1886.

Renal organ present, situated on the right side, close to the stomach.

Systematic Remarks. The genus *Paramolgula* was established by Traustedt in 1885 for a form from the Magellan Straits, *P. Schulzii*.<sup>1)</sup> In the year following, Drasche described a *Eugyra symmetra*<sup>2)</sup> (Arct. and Mediter.), which must be referred to the same genus. Like the new Norw. species, both are remarkable for the development of the genital organs on both sides of the body. As there is also a renal organ (at any rate, in *P. symmetra* and *rara*), while the rest of their structure resembles a typical *Eugyra*, this group really seems to form a transition between *Molgula* and *Eugyra*. My species is near *P. symmetra*, but is easily distinguished from it by the structure of the branchial sac, the dorsal tubercle, and the intestinal canal.

Distribution. One specimen was found at Bodø by Mr. Huitfeldt-Kaas (1894).

### *Eugyra*, Ald. and Hnk.

#### 39. *Eugyra glutinans*, H. P. C. Möll.

Traustedt, *Ascidæ simplices*, „Hauch“, V.

Jacobsen, *Die Tunicaten d. weissen Meeres*.

Distribution. Stated by Dr. Danielssen to have been found at Vadsø; if so, it occurs along the whole Norwegian coast. It is at any rate common on the south and west coasts; depth, 15—40 m, on sandy and muddy bottom.

#### 40. *Eugyra translucida*, nov. sp.

(Pl. V, figs. 13—15).

Description. Body free, without surface of attachment; has perhaps been attached to seaweed.

	External measurement.
Height . . . . .	12 mm.
Length . . . . .	11 ..
Distance between siphons at point . .	2 ..

Tunic quite thin, clear like water, without sand or fragments of shell, and attached throughout to the cuticular muscular stratum.

Siphons short, and quite close together.

Musculature developed almost exclusively upon the upper part round the orifices, where the longitudinal and circular muscles form an open network down to the upper

<sup>1)</sup> Traustedt, *Asc. simplices* fra det stille ocean (vid. meddel. fra d. naturh. foren. i Kjøbenhavn for 1884—86. Copenh. 1884—87).

<sup>2)</sup> Drasche, „*Tunicata*“ in „*Die Oesterreichische Polarstat.* Jan Mayen. Beobachtungs ergebn.“ Bd. III. p. 101, Vienna, 1886.

Omkring siphonerne i nogen afstand fra disse 2 tætte muskelringe, omtrent i høide med ringfuren (fig. 13).

Præbranchialzonen glat og meget smal ved flimregruben og her uden udbugtning; den bliver efterhaanden bredere mod endostylen (fig. 14).

Tentakler ca. 18, hvoraf 10 større, meget svagt grenede.

Flimregruben liden, enkelt bygget med svagt boiet aabning, hvis konkave side vender fortil og tilvenstre (fig. 14).

Gangliet tæt bag flimregruben, noget tilhoire for denne.

Dorsalfolden glat og med omboiet, glat rand; den løber langt forbi svælget, som sædvanlig paa dettes venstre side.

Gjællesækken er meget fin, paa hver side med 7 høie fine længdebaand, som er fæstede til de høie tværribber, men ellers svæver frit over toppene af infundibula og med 8 længderækker af disse; hvert infundibularsystem dannes af 2 spiralsnoede spirakler, hvis ender er forsynede med fortykket epithel og derfor især paa farvede præparater sees kolleformigt fortykkede. Under hveranden tværribbe tager spiraklerne sin begyndelse, og man ser derfor her i hjørnerne mellem 4 infundibula 4 noget boiede, opsvulmede spirakelender; de fra disse udgaende spirakler danner nu de dobbelt spiralsnoede infundibula paa hver side af tværribben, saaledes som fig 15 viser. Denne anordning er overalt streng lovmæssig. Fra infundibula's hjørner løber fine radiære baand op til spiralerne toppe, intermediære saadanne er ogsaa almindeligt tilstede. Mellem de af 2 spirakler dannede spiraler findes kun fine baand, ikke bredere end baandene i spiralerne selv; disse er meget smale og, idet spiraklerne hver gjør 6—7 omgange, finder man 12—15 saadanne. Infundibula er næsten kvadratiske, temmelig høie og tiltager efterhaanden i størrelse fra dorsalfolden mod endostylen (0.7—1.4 mm. brede); i den nærmest endostylen løbende længderække har infundibula delt sig i to mindre (0.6 mm. brede). Der findes som nævnt paa hver side 8 længderækker med infundibula, men kun 7 længdebaand, idet den nærmest dorsalfolden forløbende række ikke er overdækket med noget baand.

Svælget ligger nærmere flimregruben end gjællesækkens bund. Oesophagus kort, næsten lodret stillet; den foldede mave gaar uden indsnævring over i tarmen, der danner en høi slynge (i høide med svælget); tarmslyngens nedadløbende del sænker sig saa dybt ned, at den opadstigende rectum næsten dækker maven og oesophagus.

Anus er fastvokset; dens frie rand er svagt omboiet og fint lappet.

Kjønnsorganet i tarmslyngen, gaar herfra over den nedadløbende del af denne (paa indsiden), boier sig derpaa opad og lægger sig tæt op til maven. Seet indenfra ligner

curve of the intestine. Round the siphons, but at some distance from them, there are 2 dense muscular rings at about the level of the peripharyngeal band (fig. 13).

Præbranchial zone smooth, rather narrow and without protuberances at the dorsal tubercle, becoming gradually broader towards the endostyle (fig. 14).

Tentacles about 18 in number, of which 10 are large and very slightly ramified.

Dorsal tubercle small, simple in structure, and with a slightly curved opening, the concave side of which is turned forwards and to the left (fig. 14).

The ganglion is close behind, and somewhat to the right of the dorsal tubercle.

The dorsal lamina is smooth, and with smooth, downward-bent margin; it runs far beyond the oesophageal aperture, as usual on its left side.

The branchial sac is very delicate, with 7 high, delicate longitudinal bands on each side attached to the high transverse bars, but in other respects hanging freely over the tops of the infundibula, of which there are 8 longitudinal rows. Each infundibular system is formed by 2 spirally-twisted spiracles, whose ends are furnished with thickened epithelium, and therefore, especially in coloured specimens, appear clavate. The spiracles begin under every alternate transverse bar, and therefore, in the corners between 4 infundibula, are seen 4 somewhat curved, swollen spiracle ends. The spiracles issuing from these now form the twice spirally twisted infundibula on each side of the transverse bars, as shown in fig. 15. This arrangement always follows a fixed rule. From the corners of the infundibula, fine radiating bands run up to the top of the spirals, intermediate ones being also present. Between the spirals formed by 2 spiracles, there are only fine bands, no broader than the bands in the spirals themselves; the latter are very narrow, and, as the spiracles make 6 or 7 convolutions, from 12 to 15 in number. The infundibula are rather deep, and almost square, and they gradually increase in size from the dorsal lamina to the endostyle (0.7—1.4 mm. broad). In the longitudinal row nearest the endostyle, each infundibulum is divided into 2 smaller ones (0.6 mm. broad). As before mentioned, there are 8 longitudinal rows of infundibula, but only 7 longitudinal bands, the row nearest to the dorsal lamina not being covered with any band.

The oesophageal aperture is situated nearer to the dorsal tubercle than to the bottom of the branchial sac. The oesophagus is short and almost vertical in position. The folded stomach passes without any constriction into the intestine, which forms a high loop (on a level with the oesophageal aperture), the descending portion of the loop sinking so low that the ascending rectum almost covers the stomach and the oesophagus.

The anus is fixed, its free margin slightly curved and finely lobed.

The genital organ is in the intestinal loop, passing from thence into its descending portion (on the inside) and then curving upwards and lying close to the stomach.

kjønnsorganet en liggende *S*, idet den i tarmslyngen liggende del egentlig danner en tæt sammentrykt slynge. Paa den øvre rand sees talrige smaa papilleagtige udførselsgange.

Systematiske bemærkninger. Efter Herdmans bestemmelsestabel over *Eugyra*<sup>1)</sup> maatte denne form stilles nær *Eugyra kerguelensis*, Herdm. fra Kergueland Island. Begge har en tynd, gjennemsigtig kappe uden sand og en meget fint bygget gjællesæk; dog findes i modsætning til den norske form hos *E. kerguelensis* enkelte rette spirakler mellem spiralsystemerne, endvidere er muskulaturen svagere, tentaklerne og flimregruben anderledes bygget og siphonerne sidder længre fra hinanden<sup>2)</sup>. Disse forskjelligheder fjerner de to arter betydeligt fra hinanden.

Udbredelse. 1 exempl. fundet ved Beian i Trondhjemsfjorden af hr. stipendiat Huitfeldt-Kaas (1894).

Seen from within it resembles a recumbent *S*, the portion lying in the loop of the intestine forming a closely compressed loop. On the upper margin are numerous small papilla like excretory ducts.

Systematic Remarks. According to Herdman's definition of *Eugyra*<sup>1)</sup>, this form must be placed near *Eugyra kerguelensis*, Herdm., from Kerguelen Island. They both have a thin transparent tunic without sand, and a branchial sac of very delicate structure. In *E. kerguelensis*, there are found, as opposed to the Norwegian form, a few straight spiracles between the spiral systems; moreover, the musculature is weaker, the tentacles and the dorsal tubercle are differently formed, and the siphons are situated at a greater distance from one another<sup>2)</sup>. These differences separate the two species rather widely.

Distribution. One specimen was found at Beian on the Trondhjem Fjord, by Mr. Huitfeldt-Kaas (1894).

<sup>1)</sup> Herdman, Revis. Classification of Tunicata, Journ. of Linn. Soc. Zoology, Vol. 23, 1891, pag. 563.

<sup>2)</sup> Herdman, Tunicata, Challenger, Zoology, Vol. VI, pag. 81, pl. VI, fig. 4—9.

<sup>1)</sup> Herdman, Revis. Classification of Tunicata; Journ. of Linn. Soc. Zoology. Vol. 23, 1891, p. 563.

<sup>2)</sup> Herdman, Tunicata, Challenger, Zoology, Vol. VI, p. 81, pl. VI, figs. 4—9.



## Bemærkninger til den geografiske udbredelse.

Se min „Oversigt“ pag. 81—84 samt bemærkningerne under hver art; kjendskabet til den bathymetriske udbredelse er endnu meget lidet. Jeg vil her kun gjøre opmærksom paa, at Jacobsohn<sup>1)</sup> fra den sydlige del af det hvide hav, bugten ved Solowetsky, opregner flere arter, som ellers kun er kjendt i den boreale zone og ikke findes ved Norges nordlige kyst, saaledes *Molgula occulta*, Kupffer, *Molgula oculata*, Forb. og *Polycarpa pomaria*, Sav. Længer nord i det hvide hav (Kandalakskaja Guba) er af disse kun *M. oculata*, Forb. fundet. Den sandsynligste forklaring for dette er vel, at under den postglaciale periode, som efter sin fauna at dømme havde et varmere klima i Nordvest-europa end nu<sup>2)</sup>, disse former har vandret rundt Norges nordkyst ned i det hvide hav og ved den arktiske faunas fornyede fremtrængen er bleven skilt fra sit boreale udbredelsesdistrikt. Dette bestyrkes ogsaa derved, at man selv paa Spidsbergen har fundet postglaciale afleiringer med *Mytilus edulis*, *Cyprina islandica*, og endog *Litorina litorea*<sup>3)</sup>, hvilket med bestemthed tyder paa varmere klima.

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<sup>1)</sup> Jacobsohn, Ueber d. Tunicaten d. weissen Meeres (Travaux de la Société d. Nat. d. St. Pétersbourg. Vol. XXIII, 1892, pag. 168).

<sup>2)</sup> Petersen, Det vidensk. Udbytte af Kanonbaad „Hauch“s Togter. Bd. V. Kjøbenh. 1893.

<sup>3)</sup> Nathorst, Sveriges Geologi, Stockholm 1894, pag. 278.

## Remarks on the Geographical Distribution.

See my „Oversigt“, pp. 81—84, and the remarks under each species. Our acquaintance with the bathymetrical distribution is still very slight. I will here only draw attention to the fact that Jacobsohn<sup>1)</sup> enumerates from the south of the White Sea, the bay of Solowetsky, several species which are otherwise only known in the boreal zone, and are not found on the north coast of Norway, e. g. *Molgula occulta*, Kupffer, *M. oculata*, Forb. *Polycarpa pomaria*, Sav. Farther north in the White Sea (Kandalakskaja Guba), the only one of these found is *M. oculata*, Forb. The most probable explanation of this is that during the post-glacial period, when, judging from its fauna, North-western Europe possessed a warmer climate than now,<sup>2)</sup> these forms have wandered round the north coast of Norway down into the White Sea, and, by the renewed advance of the arctic fauna, have been separated from their northern habitat. This view is also strengthened by the finding, even on Spitzbergen, of post-glacial remains in *Mytilus edulis*, *Cyprina islandica*, and even *Litorina litorea*<sup>3)</sup>, which certainly indicate a warmer climate.

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<sup>1)</sup> Jacobsohn, Ueber d. Tunicaten d. weissen Meeres (Travaux de la Société d. Nat. d. St. Pétersbourg. Vol. XXIII, 1892, p. 168).

<sup>2)</sup> Petersen, Det vidensk. Udbytte af Kanonbaad „Hauch“s Togter. Bd. V. Kjøbenh. 1893.

<sup>3)</sup> Nathorst, Sveriges Geologi. Stockholm, 1894, p. 278.

## Forklaring til figurerne.

Pl. V.

- Fig. 1. *Ascidia venosa*, O. F. Müll. Svælgfeltet, svagt forstørret. *S*, svælg. *D*, dorsalfolden.
- „ 2. *Ascidia venosa*, O. F. Müll. Gangliet med flimregruben seet udenfra. Leitz, Obj. 3, Oc. 1.
- „ 3. *Molgula arctica*, nov. sp. Udtaget af kappen, seet fra venstre.  $\times 2$ .
- „ 4. *Molgula arctica*, nov. sp. Spiral mellem 5te og 6te fold. Leitz, Obj. 3, Oc. 2.
- „ 5. *Molgula arctica*, nov. sp. Tentakel. Leitz, Obj. 3, Oc. 1.
- „ 6. *Molgula arctica*, nov. sp. Flimregruben. Leitz, Obj. 3, Oc. 1.
- „ 7. *Molgula arctica*, nov. sp. Gjællesæk, 3die fold fra dorsalfolden. Leitz, Obj. 3, Oc. 2.
- „ 8. *Molgula norvegica*, nov. sp. Fra venstre. Nat. stør.
- „ 9. *Molgula norvegica*, nov. sp. Udtaget af kappen, seet fra venstre. Nat. stør.
- „ 10. *Molgula norvegica*, nov. sp. Flimregrube. Leitz, Obj. 3, Oc. 1.
- „ 11. *Molgula norvegica*, nov. sp. Tentakel. Leitz, Obj. 3, Oc. 1.
- „ 12. *Molgula norvegica*, nov. sp. Gjællesæk, 4de fold fra dorsalfolden. Leitz, Obj. 3, Oc. 0.
- „ 13. *Eugyra translucida*, nov. sp. Seet fra venstre. svagt forstørret.
- „ 14. *Eugyra translucida*, nov. sp. Flimregrube etc. Seibert, Obj. I, Oc. I.
- „ 15. *Eugyra translucida*, nov. sp. Gjællesæk. 4de længdebaand fra dorsalfolden. Seibert. Obj. I, Oc. III.
- „ 16. *Paramolgula rara*, nov. sp. Seet fra venstre. Svagt forstørret.

## Explanation of the Figures.

Pl. V.

- Fig. 1. *Ascidia venosa*, O. F. Müll. Oesophageal field, slightly magnified. *S*, oesophageal aperture; *D*, dorsal lamina.
- „ 2. *Ascidia venosa*, O. F. Müll. Ganglion with dorsal tubercle seen exteriorly. Leitz. Obj. 3, Oc. 1.
- „ 3. *Molgula arctica*, nov. sp. With tunic removed; seen from left.  $\times 2$ .
- „ 4. *Molgula arctica*, nov. sp. Spiral between 5th and 6th folds. Leitz. Obj. 3, Oc. 2.
- „ 5. *Molgula arctica*, nov. sp. Tentacle. Leitz. Obj. 3, Oc. 1.
- „ 6. *Molgula arctica*, nov. sp. Dorsal tubercle. Leitz. Obj. 3, Oc. 1.
- „ 7. *Molgula arctica*, nov. sp. Branchial sac, 3rd fold from the dorsal lamina. Letz. Obj. 3, Oc. 2.
- „ 8. *Molgula norvegica*, nov. sp. From the left. Nat. size.
- „ 9. *Molgula norvegica*, nov. sp. Seen from left, tunic removed. Nat. size.
- „ 10. *Molgula norvegica*, nov. sp. Dorsal tubercle. Leitz. Obj. 3, Oc. 1.
- „ 11. *Molgula norvegica*, nov. sp. Tentacle. Leitz. Obj. 3, Oc. 1.
- „ 12. *Molgula norvegica*, nov. sp. Branchial sac, 4th fold from dorsal lamina. Leitz. Obj. 3, Oc. 0.
- „ 13. *Eugyra translucida*, nov. sp. Seen from left, slightly magnified.
- „ 14. *Eugyra translucida*, nov. sp. Dorsal tubercle, etc. Seibert, Obj. I, Oc. I.
- „ 15. *Eugyra translucida*, nov. sp. Branchial sac, 4th longitudinal band from dorsal lamina. Seibert, Obj. I, Oc. III.
- „ 16. *Paramolgula rara*, nov. sp. Seen from left, slightly magnified.

- Fig. 17. *Paramolgula rara*, nov. sp. Udtaget af kappen  
og seet fra venstre. Svagt for-  
størret.
- „ 18. *Paramolgula rara*, nov. sp. Flimregrube. Leitz.  
Obj. 3, Oc. 1.
- „ 19. *Paramolgula rara*, nov. sp. Gjællesæk, Leitz,  
Obj. 3, Oc. 2.

- Fig. 17. *Paramolgula rara*, nov. sp. Removed from tunic,  
and seen from left. Slightly  
magnified.
- „ 18. *Paramolgula rara*, nov. sp. Dorsal tubercle.  
Leitz. Obj. 3, Oc. 1.
- „ 19. *Paramolgula rara*, nov. sp. Branchial sac. Leitz.  
Obj. 3, Oc. 2.







DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

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# ZOOLOGI.

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OM KNOPSKYDNINGEN

HOS

DISTAPLIA MAGNILARVA OG PYROSOMA ELEGANS.

AF

KRISTINE BONNEVIE.

MED 3 TAVLER.



---

CHRISTIANIA.

GRØNDAHL & SØNS BOGTRYKKERI.

1896.



THE NORWEGIAN NORTH-ATLANTIC EXPEDITION  
1876—1878.

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ZOOLOGY.

ON GEMMATION

IN

DISTAPLIA MAGNILARVA AND PYROSOMA ELEGANS.

BY

KRISTINE BONNEVIE.

WITH 3 PLATES.



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CHRISTIANIA.

PRINTED BY GRØNDAHL & SØN.

1896.



## I. *Distaplia magnilarva*.

Tab. VI.

Undersøgelsen over *Distaplia magnilarvas* knopskydning blev i høsten 1894 paabegyndt af Dr. *Johan Hjort* og mig i fællesskab, og en foreløbig meddelelse om vore resultater offentliggjordes i begyndelsen af 1895 (1). Dr. *Hjort* har imidlertid senere været for sterkt optaget til at fortsætte dette arbejde, og han har derfor overdraget til mig den videre udarbejdelse.

Af *Della Valles* undersøgelser (2), som senere er bekræftede af *Salensky* (3), fremgaar det, at det første knop-anlæg hos *Distaplia magnilarva* dannes ved en udbugtning af entodermen paa larvens ventrale side og en lignende af ektodermen paa det tilsvarende sted. Begge disse udbugtninger afsnøres snart ved sin basis, saa at de danner to koncentriske blærer, den ydre af ektodermal, den indre af entodermal oprindelse. Mellem disse blærer findes spredte mesodermceller, som ved afsnøringen blev skilt fra moderdyret.

Af denne første knop udvikles saa ved delingsprocesser to eller tre, som alle vandrer ud gennem larvens cellulosekappe og fuldender sin udvikling ude i kolonien.

*Salensky* har ogsaa leveret en indgaaende fremstilling af de forskellige organers udvikling hos *Distaplia*-knopperne, og efter denne anlægges nervesystemet fra den ydre blære, medens de øvrige organer dannes af den indre.

Dette nervesystemets anlæg fra den ydre blære staar ikke i overensstemmelse med udviklingen hos de øvrige Synascidier, som i de senere aar har været gjenstand for undersøgelse. *Pizon's* undersøgelser over *Botryllus* (4), *Hjorts* over *Botryllus* og *Polyclinum* (5 og 6), ligesom *Caulery's* over *Didemnum* (7), og *Ritters* over *Goodsiria* og sandsynligvis ogsaa *Perophora* (8), viser, at den ydre blære hos disse grupper ingen aktiv del tager i knoppens udvikling, men at alle de vigtigste organer dannes ved udbugtninger af den indre blære, hvad enten denne oprindeligt skriver sig fra larvens entoderm eller ektoderm.

## I. *Distaplia magnilarva*.

Pl. VI.

An investigation of the gemmation of *Distaplia magnilarva* was begun in the autumn of 1894 by Dr. *Johan Hjort* and myself, and a preliminary record of the results obtained was published in the beginning of 1895 (1). Since then Dr. *Hjort* has been too much occupied to continue this work, and has therefore entrusted its further discharge to me.

It appears from *Della Valle's* investigations (2), which were afterwards confirmed by *Salensky* (3), that the first indication of a bud in *Distaplia magnilarva* is formed by an evagination of the endoderm on the ventral side of the larva, and similarly of the ectoderm in the corresponding place. Both of these protuberances are soon constricted at their base, so as to form two concentric vesicles, the outer one of ectodermal, the inner one of endodermal origin. Between these vesicles are scattered mesoderm cells, which were separated by the constriction from the mother animal.

From this first bud are then developed by separation processes, two or three more, all of which find their way out through the larva's cellulose tunic, and continue their development out in the colony.

*Salensky* has also contributed a detailed account of the development of the different organs in the *Distaplia* buds, and according to this, the nervous system originates in the outer vesicle, while the other organs are formed from the inner one.

This originating of the nervous system from the outer vesicle does not harmonise with the development of other Synascidians which have of late years been the subject of investigation. *Pizon's* investigations on the subject of *Botryllus* (4), *Hjort's* on *Botryllus* and *Polyclinum* (5 & 6), *Caulery's* on *Didemnum* (7), and *Ritter's* on *Goodsiria* and probably also *Perophora* (8), show that the outer vesicle in these groups takes no active part in the development of the bud, but that all the most important organs are formed by evaginations of the inner vesicle, whether this has its origin in the endoderm or the ectoderm of the larva.



Da en nærmere undersøgelse af dette forhold forekom os at være af vigtighed, har vi søgt at vinde selvstændige erfaringer angaaende knopskydningen hos *Distaplia magnilarva*, og da specielt angaaende anlægget til *nervesystemet*. Vor undersøgelse har ført til resultater, som i væsentlige punkter staar i strid med *Salenskys*, og for skarpere at fremhæve forskjellen skal jeg tillade mig stadig at sammenholde de stadier, jeg har valgt til min fremstilling med de tilsvarende hos ham.

Da, efter *Salenskys* opfatning, nervesystemet anlægges meget tidlig, som knoppens første organ, og paa et stadium, hvor vi ikke har fundet spor af nogen organdannelse, maa jeg begynde med at beskrive dette stadium, før jeg gaar over til min fremstilling af vore undersøgelser.

Knoppen er endnu ikke afsnøret fra moderdyret; ektoderm og entoderm ligger tæt ind til hinanden, kun adskilt ved enkelte mesodermelementer, og bestaar af høje, cylinderformede celler. *Salensky* beskriver her anlægget til nervecylindret som en ektodermfortykkelse, dannet ved at et par celler er trykket ind og dækket af nye. Paa et lidt ældre stadium, hvor forbindelsen med moderdyret netop er afbrudt, har disse celler løst sig fra ektodermen, og de ligger nu som en klump bestaaende af fire celler mellem den indre og den ydre blære.

Det følgende stadium i knoppens udvikling er det første, hvori vi har kunnet constatere væsentlige forandringer i knoppens bygning, og jeg vil under min fremstilling betegne det med

#### Stadium I.

Knoppen er her fuldstændig skilt fra moderdyret og har vandret et stykke bort fra sit oprindelige sted, men den befinder sig dog endnu i larvens cellulosekappe. Den er vokset betydelig i længde. Saavel den ydre som den indre blære er tyndere, end tilfældet var før og umiddelbart efter afsnøringen, idet cellerne, som før var cylindriske, er trukket ud og for ektodermens vedkommende gaaet over til pladeepithel, medens entodermens celler nu er lave, cubiske. Da ektodermen herunder har udvidet sig forholdsvis mere end entodermen, er mellemrummet mellem begge betydelig forøget.

Den ydre blære er forøvrig aldeles uforandret, bestaar i hele knoppens udstrækning af et enkelt, skarpt begrænset celleglag uden fortykkelse eller andre væsentlige uregelmæssigheder.

Det samme er tilfældet med den indre blære, hvad knoppens forreste del angaar, og tværsnit gennem denne del viser kun to concentriske, encelledede ringe, vel adskilte, og i mellemrummet mellem dem spredte mesodermceller, dels enkeltvis, dels flere i klynge.

As a closer examination of these circumstances seemed to us important, we have endeavoured to gain independent experiences concerning gemmation in *Distaplia magnilarva*, and especially concerning the commencement of the *nervous system*. Our investigations have led to results which, in some important points, are at variance with those of *Salensky*, and in order to emphasise the difference, I will compare the stages which I have selected for my account with his corresponding stages.

As, according to *Salensky's* theory, the nervous system, as the bud's first organ, begins to form very early, and at a stage where we have found no trace of organic formation, I must begin by describing this stadium, before passing on to an account of our investigations.

The bud is not yet separated from the mother animal; the ectoderm and the endoderm lie close to one another, separated only by a few mesoderm elements, and consisting of high cylindrical cells. *Salensky* here describes the rudimentary nerve tube as a thickening of the ectoderm, formed by the pressing in of two or three cells, and the superposition of new ones. In a rather more advanced stage, where the connection with the mother animal is just broken off, these cells have become detached from the ectoderm, and lie in a lump consisting of four cells between the inner and the outer vesicle.

The following stage in the development of the bud, is the first in which we have been able to demonstrate essential changes in its structure, and in my account I will designate it as

#### Stage I.

The bud is here completely separated from the mother animal, and has moved a little away from its original place; but it is still in the larva's cellulose mantle. It has considerably increased in length. Both the inner and the outer vesicle are thinner than was the case before and immediately after separation, the cells, which before were cylindrical, having been drawn out, and, as concerns the ectoderm, become flat epithelium, while those of the endoderm are now low cubical. As the ectoderm has meanwhile expanded relatively more than the endoderm, the space between them has considerably increased.

Beyond this the *outer vesicle* is quite unchanged and, throughout the whole extent of the bud, consists of a single sharply-defined cellular stratum, without thickening or other essential irregularities.

This is also the case with the *inner vesicle* as far as the foremost part of the bud is concerned, and a transverse section through this part shows only two concentric, single-celled rings, well separated, and in the interspace scattered mesoderm cells, sometimes single, sometimes several in a group.

Længere bagover har den indre blære imidlertid undergaaet væsentlige forandringer, idet de første anlæg til *epicardier* og *tarm* viser sig. Anlægget til *epicardiet* bestaar i at blærens ventrale og dorsale væg, paa et lidet stykke nær dens bagerste ende, og efter en linie, som falder sammen med knoppens længdeakse, er smeltet sammen og gennembrudt; herved er gjælesækken paa dette stykke delt i to rør, som atter forenes bag den dannede spalte, og man vil paa tværsnit her se to mindre ringe istedetfor den ene, som viste sig længer foran, medens man ved at følge snitserien bagover vil finde, at disse atter forener sig.

Anlægget til *tarmkanalen* viser sig som en blindt endende udbugtning fra den indre blære dorsalt for det sted, hvorfra *epicardierne* udgaar.

Dette stadium er omtrent tilsvarende til det udviklingstrin, som *Salensky* har afbildet i fig. 32; men som det fremgaar af min beskrivelse, er der paa flere punkter mangel paa overensstemmelse mellem hans og vore resultater.

Han beskriver her nervesystemet som et langt, tyndt rør, der ligger tæt ind til entodermen i næsten hele knoppens længde. Det lykkedes os ikke at finde noget tilsvarende, skjønt vi meget omhyggelig undersøgte, saavel begge blærer, som de mesodermelementer, der befandt sig mellem dem. Vistnok fandtes der flere steder smaa grupper af celler; men der var ingen intim forbindelse mellem dem, og de viste sig altid kun paa et eller et par snit, saa vi maatte betragte disse ansamlinger som en tilfældig sammenstillen af mesodermceller.

I modsætning til *Salensky* har vi paa dette stadium heller ikke fundet noget anlæg til *peribranchialcaviteter*, medens *tarm* og *epicardier* er naaet til et lignende udviklingstrin. Kun har vi fundet en sammenhæng mellem begge *epicardier* i knoppens bagerste del, saa at *epicardiedannelsen* viser sig som et U-formet rør, der med begge de aabne ender munder i den midtre blære, medens *Salensky* beskriver den som to af hinanden uafhængige udbugtninger.

## Stadium II.

Det andet stadium, som jeg vil benytte til min fremstilling, har jeg illustreret ved en serie af tværsnit (fig. 1—7) og ved et mediansnit (fig. 8).

Paa dette ser man paa den indre blæres dorsale væg en forover rettet udbugtning, det første anlæg til *nervesystemet* (Dorsalrøret). Paa tværsnit viser denne udbugtning sig forrest som en ring (fig. 1), gaar dernæst over i den indre blære (fig. 2) for endelig (fig. 3) kun at vise sig som en fortykkelse af denne.

Dette anlæg til dorsalrøret hos *Distaplia* viser en paafaldende lighed med det samme anlæg hos *Botryllus*, hvad man kan se ved at sammenligne fig. 8 med *Hjorts* afbildning, (4), Tab. 36, fig. 20

Farther back, however, the inner vesicle has undergone important changes, the first rudiments of *epicardia* and *intestine* having appeared. The commencement of the former consists in the fusion and breaking through of the ventral and dorsal walls of the vesicle, on a small piece near its posterior end, and in a line coinciding with the long axis of the bud. The branchial sac on this piece is thereby divided into two channels, which reunite behind the cleft formed. In a transverse section at this point, two smaller rings will be seen instead of the one which appeared farther forward, while, by following the series of sections backwards, it will be seen that these rings once more unite.

The rudimentary *intestinal canal* appears as a blind protuberance on the inner vesicle dorsal of the spot from which the *epicardia* issue.

This stage as nearly as possible answers to that which *Salensky* has shown in his fig. 32, but, as will appear from my description, there are several points in which there is a want of agreement between his results and ours.

*Salensky* there describes the nervous system as a long, narrow tube lying close to the endoderm through almost the entire length of the bud. We did not succeed in finding anything answering to this, although we examined very carefully both the two vesicles and the mesoderm elements between them. It is true that in several places we found small groups of cells, but there was no very close connection between them, and they always appeared only on one or on a couple of sections, so that we were obliged to consider these accumulation as chance groupings of mesoderm cells.

We also differ from *Salensky* in not finding, at this stage, any indication of *peribranchial cavities*, while the *intestine* and *epicardia* have reached a similar stage. We have only found a connection between the two *epicardia* in the posterior part of the bud, so that their formation has the appearance of a U-shaped tube whose free ends open into the middle vesicle, while *Salensky* describes them as two protuberances quite independent of one another.

## Stage II.

I have illustrated the second stage which I shall employ in my account, by a series of transverse sections (figs. 1—7) and one median section (fig. 8).

On the last-named there is visible, on the dorsal wall of the inner vesicle, an anteriorly directed protuberance, the first rudiment of the *nervous system* (the dorsal tube). In transverse sections this protuberance appears as a ring (fig. 1), then passes into the inner vesicle (fig. 2) appearing lastly as a thickening of that vesicle (fig. 3).

This rudiment of a dorsal tube in *Distaplia* exhibits a striking resemblance to that in *Botryllus*, a resemblance which may be seen by comparing fig. 8 with *Hjorts* illustration (4) Pl. 36, fig. 20.



Forøvrig har knoppen paa dette stadium ingen væsentlige forandringer undergaaet; kun er *tarm* og *epicardier* tiltaget i størrelse, og tarmen har faaet en liden bøjning til høire. Det snit, som er afbildet ved fig. 4, er taget lige bag dorsalrørets udgangspunkt; fig. 5 og 6 viser, hvorledes den indre blære spaltes i tre adskilte dele, tarm og epicardier, medens fig. 7 afbilder et snit gennem knoppens bagerste del, hvor epicardierne atter har forenet sig.

### Stadium III.

Paa et endnu lidt ældre stadium ser man *peribranchialcaviteternes* anlæg. Fig. 9 *a* og *b* viser en knop paa dette stadium, seet bagfra og fra siden, og man kan her se, hvorledes baade dorsalrøret og begge peribranchialcaviteter dannes som udbugtninger fra den midtre blære, og hvorledes de endnu paa dette stadium staar i aaben forbindelse med samme. Til nærmere belysning af dette tjener en serie af tværsnit (fig. 11—18) af en lignende knop, som den i fig. 9 afbildede. Ved at betragte de tre forreste snit (fig. 11—13) ser man, hvorledes dorsalrøret og begge peribranchialcaviteter anlægges som sideordnede udbugtninger fra den indre blære, af hvis midtre og ventrale del nu gjællæsækken udvikler sig. Fig. 14 and 15 er snit fra partiet lige bag dorsalrørets udgangspunkt, fig. 16 viser gjællæsækkens overgang i tarm og epicardier, og fig. 17 er fra knoppens bagerste del, hvor epicardierne atter er forenede.

For sammenligning med knopskydningen hos de øvrige *Synascidier* er det af vigtighed at lægge merke til, at anlægget til dorsalrøret hos *Distaplia magnilarva* sker uafhængig af peribranchialcaviteternes dannelse. Thi heraf fremgaar det, at det er af underordnet betydning, naar disse anlæg hos enkelte grupper som hos *Botryllus* og *Polyclinum* staar i forbindelse med hinanden.

Til stadierne II og III svarer omtrent de stadier, som *Salensky* har afbildet i fig. 33, 34 og 35. *Nerverøret* skal efter hans fremstilling ogsaa her være langt og udvidet i begge ender, medens det paa midten er ganske smalt. I modsætning til dette har jeg, som fig. 4, 14 og 15 viser altid fundet et parti omkring midten af knoppen, vistnok ofte ganske lidet, hvor der absolut intet findes, som kan forveksles med nerverøret, medens paa de bagenfor liggende snit oviducten af og til kan have en skuffende lighed med dette, da den ligger paa samme sted i forhold til gjællæsækken og peribranchialcaviteterne og har omtrent samme vidde som nerverøret i dets bagerste tynde del. Hvis nu snitserien ikke er ganske fuldstændig, kan mangelen af et par snit midt paa knoppen, eller endog kun et for tykt snit paa angjældende sted, virke meget vildledende.

In other respects the bud in this stadium has undergone no essential change, the *intestine* and the *epicardia* alone having increased in size, and the intestine acquired a slight bend to the right. The section shown in fig. 4, is taken just behind the starting-point of the dorsal tube; fig. 5 and 6 show how the inner vesicle is cleft into 3 separate parts, intestine and epicardia, while fig. 7 shows a section through the hindmost portion of the bud, where the epicardia have again become united.

### Stage III.

In a rather more advanced stage, the rudimentary *peribranchial cavities* are seen. Fig. 9 *a* & *b* shows a bud in this stage seen from behind and from the side. It will here be seen how the dorsal tube and both the peribranchial cavities commence as evaginations from the inner vesicle, and how in this stage they are connected with it. I have illustrated this by a series of transverse sections (figs. 11—18) from a bud, similar to the one in fig. 9. From the three foremost sections (figs. 11—13) it will be evident how the dorsal tube and both the peribranchial cavities are commenced as coordinated evaginations from the inner vesicle, from whose middle and ventral portions the branchial sac now developes. Figs. 14 and 15 are sections from the region behind the starting-point of the dorsal tube; fig. 16 shows the transition of the branchial sac into the intestine and epicardia; and fig. 17 is from the hindmost part of the bud, where the epicardia are again united.

In comparing this with gemmation in the other *Synascidie*, it is important to notice that the dorsal tube in *Distaplia magnilarva* commences independently of the formation of the peribranchial cavities. It would appear from this that it is of less importance, as in certain groups, e. g. *Botryllus* and *Polyclinum*, these rudiments are in connection with one another.

The stages represented by *Salensky* in his figs. 33—35 about answer to the present stages II and III. The nerve tube, according to his statement, is long here too, and developed to both ends, while in the middle it is quite narrow. As opposed to this, I have always, as figs. 4, 14 and 15 show, found a region about the middle of the bud, — often, it is true, quite small, — where there is positively nothing that can be taken for the nerve tube, while in the posterior sections, the oviduct can now and then bear a striking resemblance to it, as it is situated in the same place in relation to the branchial sac and the peribranchial cavities, and is of about the same width as the nerve tube in its thin, hindmost part. Incompleteness in the sectional series, e. g. the absence of one or two sections in the middle of the bud, or even the excessive thickness of a single section at the place in question, will have a very misleading effect.



#### Stadium IV.

Under knoppens videre udvikling afsnøres dorsaleret bagtil fra gjællesækken, det tiltager forover i længde og dets ventrale væg lægger sig fortil tæt ind til gjællesækken, medens den dorsale væg tiltager i tykkelse. Begge peribranchialcaviteter afsnøres ogsaa fra gjællesækken og vokser derefter indbyrdes sammen udenom nerverørets bagerste del, saa at denne blir indesluttet som i et rør. Ved denne sammenvoksen af peribranchialcaviteterne er det første anlæg til *kloakken* dannet. En knop paa dette stadium er i fig. 10 a og b afbildet, seet bagfra og fra siden.

Senere opstaar der, som fig. 18 viser, aaben forbindelse mellem gjællesækken og nerverørets forreste del, anlæg til *flimmergruben*. Nerverørets dorsale væg fortykkes imidlertid mer og mer, og snart skiller det sig i de to dele, *ganglion* og *hypophysis*.

*Gangliet* anlægges altsaa hos *Distaplia* ligesom hos *Botryllus*, *Polyclinum* og de øvrige grupper som en fortykkelse af dorsalerets ene væg. Jeg tillader mig til sammenligning mellem de forskellige grupper at henvise til fig. 19—24, som alle viser snit gennem fortykkede nerverør, og hvor fig. 19—20 er af *Distaplia*, fig. 21 af *Diplosoma*, fig. 22 af *Botryllus*, fig. 23 af *Sarcobotrylloides* og fig. 24 af *Polycyclus*.

Af ovenstaaende fremstilling fremgaar det, at vore resultater med hensyn til anlægget af nervesystemet hos *Distaplia* staar i den største modsætning til *Salensky's* arbejde. Det var os umuligt at finde noget spor af nervesystemet selv paa et stadium, ældre end det, hvor det efter *Salenskys* opfatning allerede skulde være anlagt, og vi har dernæst kunnet beskrive nerverørets anlæg paa et senere stadium.

Paa den anden side tillader jeg mig at gjøre opmærksom paa den store overensstemmelse i nervesystemets anlæg, som ifølge vor undersøgelse finder sted mellem *Distaplia* og de øvrige grupper af *Synascidier*, som i de senere aar har været gjenstand for undersøgelse.

Vore resultater angaaende de første anlæg til nervesystem og peribranchialcaviteter stemmer ogsaa fuldstændig overens med *Kowalerskys* beskrivelse af dem hos *Didemnum styliiferum*, syn. *Distaplia styliiferum* (9).

#### Stage IV.

During the further development of the bud, the dorsal tube becomes separated posteriorly from the branchial sac; it increases in length anteriorly, and its ventral wall advances anteriorly up to the branchial sac, while the dorsal wall increases in thickness. Both the peribranchial cavities are also separated from the branchial sac, and then grow together outside the hindmost portion of the nerve tube, thereby, as it were, enclosing it in a tube. This growing together of the peribranchial cavities forms the first rudiment of the *cloaca*. Fig. 10 a & b shows a bud in this stage seen from behind and from the side.

Subsequently, as fig. 18 shows, an open connection is formed between the branchial sac and the anterior portion of the nerve tube, the rudimentary *dorsal tubercle*. The dorsal wall of the nerve tube meanwhile becomes thicker and thicker, and soon divides into two parts, *ganglion* and *hypophysis*.

Thus the ganglion commences in *Distaplia*, as in *Botryllus*, *Polyclinum* and the other groups, as a thickening of one wall of the dorsal tube. For comparison of the different groups, I would direct attention to figs. 19—24, which all show sections through the thickened nerve tube. Figs. 19, 20 are *Distaplia*, fig. 21 *Diplosoma*, fig. 22 *Botryllus*, fig. 23 *Sarcobotrylloides*, and fig. 24 *Polycyclus*.

It will be seen from the above that our results with regard to the commencement of the nervous system in *Distaplia* differ very considerably from those of *Salensky*. It was impossible for us to find any trace of a nervous system, even in a more advanced stage than that in which, according to *Salensky*, it has already commenced, and we have described the commencement of the nerve tube in a later stadium.

On the other hand, I would draw attention to the similarity which, according to our investigations, exists between the commencement of the nervous system in *Distaplia*, and of that in the other groups of *Synascidiae* which have of late years been the subject of investigation.

The conclusions at which we have arrived regarding the first rudiments of the nervous system and the peribranchial cavities, also agree perfectly with *Kowalersky's* description of them in *Didemnum styliiferum*, syn. *Distaplia styliiferum* (9).

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## Figurforklaring.

Pl. VI.

For samtlige figurer gjælder følgende betegnelser:

<i>Eg</i> = Egestionsaabning.	<i>Ing</i> = Ingestionsaabning.
<i>Ekt</i> = Ektoderm,	<i>Mes</i> = Mesoderm.
<i>Ent</i> = Entoderm,	<i>Nr</i> = Nerverør.
<i>End</i> = Endostyl,	<i>Od</i> = Oviduct.
<i>Ep</i> = Epicardium,	<i>Pbc</i> = Peribranchialcavitet,
<i>G</i> = Genitalorgan,	<i>Per</i> = Pericardium,
<i>Kd</i> = Gjællesæk,	<i>T</i> = Tarm.
<i>Kl</i> = Kloak.	

Fig. 1—7.	Serie af tversnit gennem en knop af Stadium II.
Fig. 8.	Mediansnit gennem en knop af samme stadium.
Fig. 9.	Knop af Stadium III, <i>a</i> , seet fra siden, <i>b</i> , seet bagfra.
Fig. 10.	Knop af Stadium IV, <i>a</i> , seet bagfra, <i>b</i> , seet fra siden.
Fig. 11—17.	Serie af tversnit gennem en knop af Stadium III.
Fig. 18.	Skematiseret fremstilling af forreste del af en ældre knop.
Fig. 19, 20.	Fortykket nerverør af Distaplia.
Fig. 21.	— " - Diplosoma.
Fig. 22.	— " - Botryllus.
Fig. 23.	— " - Sarcobotrylloides.
Fig. 24.	— " - Polycyclus.

## Explanation of the figures.

Pl. VI.

The following abbreviations are used in all the figures:

<i>Eg</i> = atrial aperture,	<i>ing</i> = branchial aperture.
<i>ekt</i> = ectoderm,	<i>mes</i> = mesoderm,
<i>ent</i> = endoderm,	<i>nr</i> = nerve tube,
<i>end</i> = endostyl,	<i>od</i> = oviduct,
<i>ep</i> = epicardium,	<i>pbc</i> = peribranchial cavity.
<i>g</i> = genital organ,	<i>per</i> = pericardium,
<i>kd</i> = branchial sac,	<i>t</i> = intestine.
<i>kl</i> = cloaca,	

Figs. 1—7.	Series of transverse sections through a bud in Stage II.
Fig. 8.	Median section through a bud in the same stage.
Fig. 9.	Bud in Stage III; <i>a</i> , seen, from the side, <i>b</i> , seen from behind.
Fig. 10.	Bud in Stage IV; <i>a</i> , seen from behind, <i>b</i> , seen from the side.
Figs. 11—17.	Series of transverse sections through a bud in Stage III.
Fig. 18.	Diagrammatic drawing of the anterior part of an older bud.
Figs. 19, 20.	Thickened nerve tube of Distaplia.
Fig. 21.	— " " - Diplosoma.
Fig. 22.	— " " - Botryllus.
Fig. 23.	— " " - Sarcobotrylloides.
Fig. 24.	— " " - Polycyclus.



## II. *Pyrosoma elegans*.

I de senere aar har man ved nye undersøgelser over knopskydningen hos forskellige arter af *Synascidier* fundet, at organernes nydannelse fra knoppens indre blære er et gennemgribende led i deres udviklingshistorie. Og jo mere gennemgribende denne udviklingsmodus viser sig at være inden gruppen af *Synascidier*, desto større blir den kløft, som maa reises mellem de ellers saa nærstaaende grupper *Synascidier* og *Pyrosoma* ved væsentlige forskelligheder i deres knopskydning.

Fra et theoretisk standpunkt lyder det derfor noget tvilsomt, at knopskydningen hos *Pyrosoma* efter *Salensky's* (1) og *Seeliger's* (2) undersøgelser, skal foregaa efter helt andre principer end den samme proces hos *Synascidierne*, og endnu mere, at efter de nævnte undersøgelser udviklingen af de fire første knopper i en *Pyrosoma*-koloni skal være væsentlig forskellig fra de senere anlagte knoppers udvikling, idet peribranchialcaviteter og nervesystem hos hine anlægges fra ektodermen (*Salensky*), medens samme organer hos disse fremkommer som mesodermale dannelser (*Seeliger*); hos *Synascidierne* derimod dannes de, som ovenfor nævnt, af knoppens indre blære, ligegyldig om denne oprindeligt skriver sig fra larvens ektoderm eller entoderm. Der reiser sig da uvilkaarlig det spørgsmaal, om denne mangel paa overensstemmelse muligens skulde bero paa uøiagtighed i observationerne.

Jeg har derfor underkastet knopskydningen hos *Pyrosoma* en fornyet undersøgelse, og er herunder, som jeg nedenfor skal søge at vise, kommen til resultater, hvorefter *Pyrosomas* slægtskab med *Synascidierne* ogsaa bekræftes ved lighed i udviklingen af deres knopper.

Til min undersøgelse har jeg benyttet en meget godt konserveret koloni af *Pyrosoma elegans* fra den biologiske station i *Neapel*. Men da der i denne ikke var anledning til at undersøge udviklingen af de fire første ascidiozoider, har jeg foreløbig maattet indskrænke mig til behandling af de senere knopplanlæg.

*Huxley* (4) og *Kowalevsky* (5) har tidligere berørt spørgsmaalet om knopskydningen hos *Pyrosoma*; og mere

## II. *Pyrosoma elegans*.

It has of late years been ascertained by fresh investigations with regard to gemmation in the different species of *Synascidia*, that the formation of the organs from the inner vesicle of the bud is an important link in the history of their development. The more radical this manner of development shows itself to be in the Synascidian group, the sharper will be the line which must be drawn between the otherwise so nearly-allied groups, *Synascidia* and *Pyrosoma*, by the essential differences in their gemmation.

From a theoretical point of view, it therefore seems somewhat doubtful whether, as *Salensky* (1) and *Seeliger* (2) maintain, gemmation in *Pyrosoma* proceeds on a totally different principle to that in the *Synascidia*; and still more so that the development of the first four buds in a *Pyrosoma* colony, is essentially different from that of later buds, the peribranchial cavities and the nervous system of the originating in the ectoderm (*Salensky*), while in the latter these organs commence as mesodermal formations (*Seeliger*). In the *Synascidia*, on the other hand, they are formed, as already stated from the inner vesicle of the bud, whether that vesicle originates in the ectoderm or the endoderm of the larva. The question therefore involuntarily presents itself, whether this want of harmony may not possibly be due to an inaccuracy of observation.

I have therefore subjected gemmation in *Pyrosoma* to renewed investigation, and, as I shall attempt to show, have arrived at results whereby the relationship of *Pyrosoma* to *Synascidia* is also confirmed by a resemblance in the manner of the development of their buds.

In my investigations, I have employed a very well preserved colony of *Pyrosoma elegans* from the biological station at *Naples*; but as there was in it no opportunity of examining the development of the first four Ascidiozooids, I am for the present obliged to confine myself to the treatment of that of the later buds.

*Huxley* (4) and *Kowalevsky* (5) have previously touched upon the question of budding in *Pyrosoma*, and more

indgaaende undersøgelser er i den senere tid foretaget af *Joliet* (6) og *Seeliger* (2 og 3), som begge beskriver *peribranchialcaviteter* og *nervesystem* som *mesodermale* dannelser.

Knopperne hos *Pyrosoma* anlægges, som det af de nævnte arbejder er bekendt, ved at moderdyrets *entoderm* bugter sig ud ved endostylens nedre ende, idet den danner et tyndt rør, som gennem *eleoblasten* strækker sig helt henimod *ektodermen*, der nu ogsaa begynder at bugte sig ud. Entodermrøret er noget sammentrykt i dorso-ventral retning, og det viser sig paa snit at have en rektangulær form; *ektodermen* bestaar i knopskydningsregionen af kubiske celler med jevn overgang til pladeepithelet, som ellers omgiver moderdyret (Se fig. 5). Mellem disse lag findes paa undersiden af knop anlægget en temmelig kompakt *mesodermcellemasse*, hvori enkelte celler, de senere ægceller, udmerker sig fremfor de øvrige ved sin størrelse. Af mesodermelementer findes endvidere, efter *Seeliger*, to *mesenchym*-strenger, som strækker sig langs entodermrøret paa begge sider, og desuden enkelte spredte celler.

*Peribranchialcaviteterne* optræder allerede paa et stadium, hvor knoppen kun viser sig som en svag udbugtning af moderdyret, og de stammer, efter *Seeligers* opfatning, afgjort fra *mesodermen*, hvorimod han ikke udtaler sig bestemt om, enten de skriver sig fra de *mesenchym*-strenger, som ligger langs entodermrøret, eller fra den større cellemasse paa knoppens underside.

*Nervesystemet* anlægges, efter *Seeligers* undersøgelse, paa et noget senere stadium, ved at *mesodermcellemassen* strækker sig forover i knoppen, rundt entodermrørets spids, saa at en del af den kommer til at ligge paa knoppens overside. Denne del, den *neurale* mesoderm, afsnøres snart fra den underste, den *hæmale*, og samtidig antager den formen af et rør, *nerverøret*, idet der dannes en spalte i dens indre.

Angaaende denne første oprindelse til *peribranchialcaviteter* og *nerverør* er jeg kommen til andre resultater end *Seeliger*, og jeg skal, under min behandling af de forskellige stadier af knopper, specielt tage hensyn til disse organer, idet jeg, hvad knoppens øvrige udvikling angaar, henviser til *Seeligers* indgaaende beskrivelse.

### Stadium I.

Jeg begynder med at beskrive et stadium som det paa fig. 7 afbildede, hvor knoppen viser sig som en meget tydelig udbugtning af moderdyret, men hvor nogen afsnøring endnu ikke er begyndt. *Ektodermen* bestaar her, som paa senere stadier, af kubiske celler, medens entodermrøret begrænses af cylinderepithel.

*Entodermrøret* er firkantet, men med indboiede sideflader, saa det paa snit viser sig korsformet. Paa denne maade dannes mellem *ektoderm* og *entoderm* fire parallelle

thorough investigations have lately been made by *Joliet* (6) and *Seeliger* (2 and 3), both of whom describe the *peribranchial cavities* and the *nervous system* as *mesodermal* formations.

As is well known from the above-named works, the buds in *Pyrosoma* originate in the evagination of the *endoderm* of the mother animal at the lower end of the endostyle, thus forming a narrow tube which extends through the *eleoblast* up to the *ectoderm*, which now also begins to bulge. The endodermal tube is somewhat compressed in a dorso-ventral direction, and exhibits in section a rectangular shape. In the budding region, the *ectoderm* consists of cubical cells with an even transition to flattened epithelium, which also envelopes the mother animal (See fig. 5). Between these layers, on the lower side of the incipient bud, there is a fairly compact mass of *mesoderm cells*, in which certain cells, the future egg-cells, are distinguished from the others by their size. According to *Seeliger*, there are, moreover, of mesoderm elements, two *mesenchymal* cords, extending on both sides along the endodermal tube and a few scattered cells.

The *peribranchial cavities* have already made their appearance at a stage when the bud only appears like a slight swelling of the mother animal, and, according to *Seeliger*, they undoubtedly originate in the *mesoderm*, though that writer gives no decided opinion as to whether they are from the *mesenchymal* cords, or from the large cellular mass on the under side of the bud.

According to *Seeliger*, the *nervous system* commences to form at a somewhat later stage, by the expansion of the mass of *mesoderm cells* forwards in the bud, and round the point of the endodermal tube, so that a portion of it reaches the upper side of the bud. This part, the *neural* mesoderm, is soon cut off from the lower, the *hæmal* mesoderm, and simultaneously assumes the form of a tube — the *nerve tube* —, a cleft being formed within it.

With regard to the origin of the *peribranchial cavities* and the *nerve tube*, I have arrived at a different conclusion to *Seeliger*, and shall, in treating of the different stages of buds, pay special attention to these organs, while as regards the development of the rest of the bud, I would refer the reader to *Seeliger's* detailed description.

### Stage I.

I will begin by describing a stage like that represented in fig. 7, where the bud appears as a very distinct evagination of the mother animal, but where no separation has as yet begun to take place. The *ectoderm*, here as in later stages, consists of cubical cells, while the endodermal tube is bounded by cylindrical epithelium.

The *endodermal tube* is quadrangular, but with incurved lateral surfaces, so that, in section, it has the shape of a cross. In this way, there are formed between the



rør, under, over og paa siderne af entodermrøret. Det første af disse optages af mesodermstrengen, over entodermrøret findes paa dette stadium endnu kun spredte mesodermceller, medens begge siderør optages af *peribranchialrørene* (fig. 6).

Paa dette stadium er *peribranchialcaviteterne* altsaa anlagte, og ved at betragte en snitserie (fig. 1—6) vil man se, hvorledes de dannes ved at en del af entodermrørets cellevæg paa hver side bugter sig ud for at lægge sig som et blad ved siden af dette. Snitretningen betegnes ved linierne *a-b*, *c-d*, o. s. v. paa fig. 7, og saaledes, at fig. 1 betegner et snit gennem linien *a-b*, fig. 2 og 3 er to paa hinanden følgende snit ved *c-d*, fig. 4's stilling betegnes ved *e-f*, o. s. v.

*Peribranchialcaviteterne* anlægges vistnok noget tidligere, paa et stadium svarende til *Seeliger's* fig. 5 (2); men jeg har til min fremstilling valgt en saa udviklet knop, for at jeg ved afbildninger som fig. 5 og 6 skulde være istand til at fjerne enhver tvil om, at det virkelig er *peribranchialcaviteterne*, som anlægges ved denne udbugtning af entodermen.

Paa noget yngre knopper har jeg ved at benytte en anden snitretning fundet billeder som fuldstændig svarer til *Seeliger's* fig. 41 og 43 (2); men som man vil se af fig. 7, kan man ikke faa noget tydeligt billede af sammenhængen mellem entodermrøret og *peribranchialcaviteterne* uden netop ved serier, som har nogenlunde samme snitretning som den, jeg har afbildet.

Eftersom knoppen nu vokser, afsnøres dens forbindelse med moderdyret noget, saa den staar fæstet ved en tyndere stilk, hvori dog endnu alle knoppens organer findes. Af forandringer, som foregaar i knoppens indre, kan merkes:

*entodermrørets* to nederste grene vokser sterkere end de øverste, og danner derved det første anlæg til tarmtractus;

i *peribranchialcaviteterne*, som strækker sig helt ud mod knoppens spids, optræder et tydeligt hulrum;

*mesodermstrengen*, hvori knoppens æg træder tydelig frem mod de øvrige celler, strækker sig forover omkring entodermrørets spids, idet den lægger sig tæt op til ektodermen, hvor den holder sig som et sammenhængende lag gennem de følgende stadier.

## Stadium II.

Ved at betragte fig. 8, som er en halv schematiseret fremstilling af en knop paa dette stadium, ser man, at begge *peribranchialcaviteter* i knoppens dorsale parti, det, som ligger nærmest moderdyret, har forenet sig under entodermrøret; samtidig ser man paa hver side et tapformet anlæg, som udgaar fra *peribranchialcaviteten* lige over forbindelsesstedet, og som strækker sig et stykke opover mellem denne og ektodermen. Dette dobbelte anlæg viser sig

ektoderm og the endoderm, four parallel tubes, respectively beneath, above, and at the sides of the endodermal tube. The first of these is occupied by the mesoderm cord; above the endodermal tube at this stage, there are as yet only scattered mesoderm cells, while the two lateral tubes are occupied by the *peribranchial tubes* (fig. 6).

Thus the formation of the *peribranchial cavities* has commenced at this stage, and on looking at a sectional series (figs. 1—6), it will be seen that they are formed by the evagination of a portion of the cellular wall on each side of the endodermal tube, beside which they lie like a leaf. The plane of the sections is indicated by the lines *a b*, *c d*, etc. in fig. 7. Thus, fig. 1 represents a section through line *a b*, figs. 2 and 3 are two consecutive sections at *c d*, the plane of fig. 4 is indicated by the line *e f*, etc.

The *peribranchial cavities* commence, it is true, rather earlier, at a stage answering to *Seeliger's* fig. 5 (2); but I have chosen a bud of the more advanced stage, in order that I might, by such figures as 5 and 6, remove all doubt as to the really being the *peribranchial cavities* which commence with this evagination of the endoderm.

By taking sections in another plane, I have obtained, in a somewhat less advanced bud, results which exactly correspond with *Seeliger's* figs. 41 and 43 (2); but as my fig. 7 shows, no very clear idea of the connection between the endodermal tube and the *peribranchial cavities* is to be gained, except by such series as are in a plane somewhat similar to that which I have here given.

With the growth of the bud, its connection with the mother animal becomes more interrupted, until it is attached by a thin stalk, in which, however, all the organs are still found. Among the changes which take place in the interior of the bud, the following may be noticed:

The two lowest branches of the *endodermal tube* grow more quickly than the upper ones, and thus form the first rudiments of the intestinal region;

A distinct cavity appears in the *peribranchial tubes*, which extend to the very point of the bud;

The *mesodermal cord*, in which the ova of the bud are conspicuous among the other cells, extends forwards about the point of the endodermal tube lying close up to the ectoderm, where it remains, like a compact stratum, through the subsequent stages.

## Stage II.

On looking at fig. 8, which is a semi-diagrammatic representation of a bud in this stage, it will be seen that the two *peribranchial cavities* in the dorsal part of the bud — the part nearest to the mother animal —, have become united beneath the endodermal tube. At the same time there is visible, on each side, a process-like formation, issuing from the *peribranchial cavity* just above the point of union, and extending a little way up between the cavity



ved sammenligning med senere stadier at være oprindelsen til knoppens *nervesystem*.

Fig. 9—15 afbilder en snitserie af en knop paa dette stadium, med snitretning lodret paa moderdyrets længdeakse og altsaa parallel en linie *a-b* (fig. 8).

Fig. 11 viser, hvorledes en del af den ene peribranchialcavitet afsnøres for længer nede (fig. 10 og 9) at smelte sammen med udbugtningen fra den anden, saa at de kommer til at danne en aaben forbindelse mellem begge peribranchialcaviteter.

Her kan ikke være tale om nogen forveksling med anlægget til kloakken, da denne først viser sig paa et langt senere stadium (fig. 28 og 33); og man kan paa et og samme snit gennem et saadant stadium se baade kloakken og nerverørets nederste del (fig. 37).

Paa fig. 12, som viser et snit lige over det paa fig. 11 afbildede, ser man, at en del af peribranchialcavitets cellevæg fortykkes for længer oppe at vise sig som en selvstændig cellestreng (fig. 13 og 14), der dog ikke strækker sig op over entodermrøret (paa fig. 15, et snit fra knoppens øverste del, findes intet spor af nogen saadan streng).

Fra nu af vokser knoppen forholdsvis mere i vertikal retning, peribranchialcaviteterne begynder i knoppens proximale del at udbrede sig nedover, og efterhvert som denne udbredelse skrider frem, trænges entodermrørets tarmanlæg frem mod knoppens distale ende. Nogen væsentlig forandring viser sig dog ikke før ved

### Stadium III.

Her ser man (fig. 16) *nervesystemet* paa et videre udviklingstrin. Det nedre anlæg har ingen væsentlig forandring undergaaet, men de to opstigende cellestrengene er vokset sammen over entodermrøret, hvor de har udviklet sig til en stor cellehob. Ved snit gennem denne cellemasse ser man en mængde celler under deling, hvilket kan forklare den hurtige udvikling af denne øvre del af nervesystemet.

Fig. 17 og 18 viser to snit af en serie, hvis snitretning er parallel linierne *a-b* og *c-d* paa fig. 16. Paa fig. 17 ser man, hvorledes nervesystemet ligger som en ring omkring entodermrøret og peribranchialcaviteterne, og hvorledes dets nedre bue staar i aaben forbindelse med disse, medens der endnu ikke er dannet noget hulrum i de opstigende grene. Fig. 18 er et snit længer foran, omtrent ved *c-d* (fig. 16), og her ser man, at der har dannet sig en spalte indvendig i den forreste del af cellehoben.

Nervesystemet vokser nu mindre end knoppens øvrige del, og da denne fortsætter sin hoidetilvæxt, kommer hele nervesystemet snart til at ligge paa knoppens dorsale side.

and the ectoderm. This double rudiment proves, on comparison with later stages, to be the origin of the *nervous system* of the bud.

Figs. 9—15 exhibit a series of sections from a bud in this stage, the plane of the sections being perpendicular to the long axis of the mother animal, and therefore parallel to line *a-b* (fig. 8).

Fig. 11 shows how part of one peribranchial cavity is separated, and merges lower down (figs. 10 and 9) into the evagination from the other, so as to form and open connection between the two peribranchial cavities.

There can be no possibility here of confounding this with the rudimentary cloaca, as this does not make its appearance until a much later stage (figs. 28 and 33); and in one section of a bud in such a stage, both the cloaca and the lower part of the nerve tube can be seen (fig. 37).

In fig. 12, which shows a section just above that shown in fig. 11, it will be seen that part of the cellular wall of the peribranchial cavity is thickened and appears farther up as an independent cellular cord (figs. 13 and 14) which, however, does not extend upwards over the endodermal tube. (In fig. 15, a section from the upper part of the bud, there is no trace of any such cord).

Henceforward the bud grows comparatively more in a vertical direction; the peribranchial cavities begin, in the proximal part of the bud, to expand downwards, and simultaneously with the progress of this expansion, the intestinal rudiment issuing from the endodermal tube is forced towards the distal end of the bud. No essential change, however, appears until the succeeding stage.

### Stage III.

Fig. 16 shows the *nervous system* in a more advanced stage of development. The lower rudiment has undergone no essential change, but the two ascending cellular cords have grown together over the endodermal tube, where they have developed into a large cellular mass. On making sections through this mass, a number of cells are seen in the process of dividing, a circumstance which may account for the rapid development of this upper portion of the nervous system.

Figs. 17 and 18 show two sections from a series whose plane is parallel with the lines *a-b* and *c-d* in fig. 16. Fig. 17 shows how the nervous system lies in a ring about the endodermal tube and the peribranchial cavities, and how its lower arch is in open communication with the latter, while no cavity is as yet formed in the ascending branches. Fig. 18 is a section taken farther forward, at about *c-d* (fig. 16), and here it will be seen that a cleft has been formed internally in the front part of the cellular mass.

The nervous system now grows less rapidly than the rest of the bud, and as the latter continues to increase in height, the whole nervous system in soon on the dorsal side of the bud.

#### Stadium IV.

Paa dette stadium er *peribranchialcaviteterne* fuldstændig adskilt fra forbindelsen med moderdyret; de er vokset betydelig nedover og har derved trængt tarmanlægget temmelig langt frem i knoppens distale ende.

Ved at følge en snitserie (fig. 20—25), med samme snitretning som ved stad. II, ser man, at *nerverøret* endnu staar i aaben forbindelse med *peribranchialcaviteterne* (fig. 20—22), og at det nu ogsaa ovenfor forbindelsesstedet viser sig som to rør (fig. 23 og 24), der over *entodermrøret* smelter sammen til et (fig. 25). Dette større rør, *nerverørets øvre blære*, strækker sig et stykke opover, medens dets langstrakte form mer og mer gaar over til cirkelformen, og ender tilslut blindt. — Fig. 26 viser et snit af en anden serie med forbindelse mellem *nerverør* og *peribranchialcaviteter*.

#### Stadium V.

Under knoppens videre udvikling afsnøres denne forbindelse (fig. 27—28), og samtidig fortykkes den dorsale væg af *nerverørets øvre blære*, som lægger sig tæt ind til *entodermen* (fig. 28 og 29).

Begge *peribranchialcaviteter* vokser sammen under *entodermrøret* og danner herved det første anlæg til *kloakken*. Ogsaa *gjællespalterne* anlægges efterhaanden ved sammensmeltning mellem *peribranchialcaviteternes* indre vægge og siderne af *entodermrøret*.

*Tarmanlægget* træder skarpere frem mod den øvrige del af *entodermrøret*, *gjællesækken*, idet *entodermrørets* forreste, distale, væg bugter sig temmelig sterkt ind (fig. 28 og 29\*) og derved danner en forbindelse oven til mellem de to ældre udbugtninger og giver *tarmanlægget* form af en hestesko. Samtidig afsnøres dette ogsaa paa venstre side fra *gjællesækken*, og denne side omdannes senere til den egentlige tarm, medens den høire gren vedbliver at staa i forbindelse med *gjællesækken* og bliver til *oesophagus*.

Til belysning af dette forhold henviser jeg til fig. 33 og til snitserien (fig. 34—37). Paa fig. 34 er forbindelsen mellem begge tarmudbugtninger truffet; paa fig. 35 ser man, hvorledes høire gren bliver i forbindelse med *gjællesækken*, medens venstre afsnøres og danner tarmen. Fig. 36 og 37 er truffet længere nede og viser anlægget til *kloakken*.

*Nervesystemet* undergaar endnu store forandringer, før det naar sin fulde udvikling. Fortykkelsen af rørets dorsale væg skrider hurtig frem, og paa samme maade som hos *Synascidierne* dannes *ganglion* og *hypophysis* af det oprindelige *nerverør* ligesom ogsaa *flimmergruben* anlægges ved en sam-

#### Stage IV.

In this stage, the connection between the *peribranchial cavities* and the mother animal is entirely broken off; the cavities have grown considerably in a downward direction, thereby forcing the rudimentary intestine rather far forwards in the distal end of the bud.

By following a series of sections (figs. 20—25) having the same sectional plane as in stage II, it will be seen that the *nerve tube* is still in open communication with the *peribranchial cavities* (fig. 20—22), and that also above the point of connection, it appears as two tubes (figs. 23 and 24) which are fused into one above the *endodermal tube* (fig. 25). This larger tube — the *upper vesicle of the nerve tube* — extends upwards a little way, its elongated shape becoming by degrees circular, and being blind at its termination. Fig. 26 represents a section of another series, with the connection between the *nerve tube* and the *peribranchial cavities*.

#### Stage V.

During the further development of the bud, this connection between the *nerve tube* and the *peribranchial cavities* is broken off (figs. 27 and 28), while at the same time, a thickening of the dorsal wall of the upper vesicle of the *nerve tube* takes place, the vesicle taking up a position close to the *endoderm* (figs. 28 and 29).

The *peribranchial cavities* grow together beneath the *endodermal tube*, thereby forming the first rudiment of the *cloaca*. The *branchial stigmata* also commence gradually to form, by the coalescing of the inner walls of the *peribranchial cavities* and the sides of the *endodermal tube*.

The rudimentary intestine is more conspicuous towards the upper part of the *endodermal tube* — the *branchial sac* —, the foremost, distal wall of the *endodermal tube* being considerably bent in (figs. 28 and 29\*), thereby forming a connection above between the two earlier evaginations, and giving the rudimentary intestine the shape of a horse-shoe. At the same time, the left side of this is also separated from the *branchial sac*, and subsequently transformed into the intestine proper, while the right ramus remains connected with the *branchial sac*, and becomes the *oesophagus*.

In illustration of this, I would direct attention to fig. 33 and to the sectional series represented in figs. 34—37. In fig. 34, the connection between the two evaginations of the intestine has been made; fig. 35 shows how the right ramus remains in connection with the *branchial sac*, while the left is cut off and forms the intestine. Figs. 36 and 37 are of sections taken farther down, and represent the incipient *cloaca*.

The *nervous system* undergoes further important changes before it attains to a state of full development. The thickening of the dorsal wall of the tube proceeds rapidly, and the *ganglion* and *hypophysis* are formed from the original *nerve tube* in the same manner as in the *Synascidiæ*,



mensmeltning af nerverørets forreste del med gjællesækken. — Gangliet udvikler sig sterkt og dækker fuldstændig hypofysen, som efterhaanden skrumper ind til et meget tyndt rør, som ikke engang naar gangliets nederste kant. — Nerverørets to *sidegrene* mister sit lumen og omdannes til et par ganske tynde nerver, som udgaar fra gangliets nederste spids (fig. 30—32); deres forbindelse under entodermrøret svinder ogsaa ind til en tynd cellestreng.

Jeg har i min beskrivelse af knoppernes udvikling udelukkende taget hensyn til den først anlagte knop, altsaa den distale i knoprækken, da organernes oprindelige anlæg har været maalet for min undersøgelse. — Jeg skal dog tilslut ogsaa med et par ord berøre udviklingen af de *proximale knopper* i kjæden.

*Peribranchialcaviteterne*, der, som ovenfor beskrevet, blev anlagt i moderdyret, før der egentlig kunde være tale om nogen knop, strækker sig gennem hele rækken og fordeles ved indsnoring, ligesom ektodermen, entodermrøret og mesodermstrengen, paa de forskellige knopper.

De organer derimod, som først blev anlagt, efter at knoppens afsnoring fra moderdyret var begyndt, deriblandt *nervesystem* og *tarmtractus*, anlægges ogsaa i hver af de proximale knopper paa samme maade som i den distale.

### Resumé.

1. **Knoppens ydre blære** bestaar fra først af af høie cubiske celler, og den undergaar under knoppens udvikling ingen forandringer, naar undtages dem, som skyldes knoppens væxt; cellerne bliver paa de senere udviklingsstadier noget lavere uden dog at gaa over til pladeepithel, før mod slutten af knoppens udvikling.
2. Fra **mesodermen** anlægges *pericardium*, *cleoblast* og de sædvanlige mesodermale organer, *generationsorganer*, *muskler*, o. s. v.
3. **Knoppens indre blære** stammer fra moderdyrets endostyl og bestaar under de første stadier af knoppens udvikling af høie cylinderceller, som senere bliver noget lavere.

Fra knoppens *indre blære* anlægges følgende organer:

- a. *Peribranchialcaviteterne*, som anlægges allerede i moderdyret ved at en del af entodermrørets vægge paa hver side bugter sig ud og lægger sig som et blad ved siden af dette. De strækker sig gennem hele knoprækken; men de afsnøres fuldstændig mellem hver knop, medens entodermrøret kun indsnævres. — *Peribranchialcaviteterne* spiller en stor

as also the *dorsal tubercle* by the coalescing of the anterior part of the nerve tube with the branchial sac. The ganglion develops quickly, and completely covers the hypophysis, which gradually shrinks into a very narrow tube, reaching not even as far as the lower edge of the ganglion. The two *lateral rami* of the nerve tube lose their lumen, and are transformed into two very thin nerves, issuing from the lower end of the ganglion (figs. 30—32): their connection beneath the endodermal tube also diminishes to a thin cellular cord.

In my account of the development of the bud, I have exclusively considered the first formed bud — the distal one in the series of buds —, as the original incipency of the organs has been the aim of my investigations. Before concluding, however, I will also, in a few words, touch upon the development of the *proximal buds* in the chain.

The *peribranchial cavities*, which, as already stated, had commenced to form in the mother animal before anything like a bud was visible, extend through the whole series, and are distributed by constriction among the different buds, as are also the ectoderm, the endodermal tube and the mesodermal cord.

On the other hand, those organs which did not begin to form until after the process of separation of the bud from the mother animal had commenced — the *nervous system* and the *intestinal region*, among others —, commence in each of the proximal buds in the same way as in the distal.

### Recapitulation.

1. The **outer vesicle of the bud** consists, from its commencement, of high cubical cells, and during the development of the bud, undergoes no change but such as is occasioned by the growth of the bud. In the later stages of development, the cells become somewhat lower, without however changing into flattened epithelium until the completion of the bud's development.
2. From the **mesoderm** are developed the *pericardium*, the *cleoblast* and the usual mesodermal organs, the *generative organs*, *muskles*, etc.
3. The **inner vesicle of the bud** originates in the endostyle of the mother animal, and during the earlier stages of development consists of high cylindrical cells, which subsequently become somewhat lower.

From the *inner vesicle* of the bud are formed the following organs:

- a. The *peribranchial cavities*, which have already commenced in the mother animal by the evagination of a part of the wall on each side of the endodermal tube, and its disposition beside the latter like a leaf. They extend throughout the series of buds, being, however, completely severed between the buds, while the endodermal tube is only con-



rolle i knoppens udviklingshistorie, idet de foruden at danne anlægget til *nervesystemet* (se nedenfor), ogsaa danner *kloakken* og er delagtige i dannelsen af *gjællespalterne*.

b. *Nervesystemet*, der anlægges fra peribranchialcaviteterne ved at disse, som paa tidligere stadier var fuldstændig adskilte, forbindes ved et rør under entodermrøret paa knoppens proximale side, medens samtidig paa hver side en tapformet cellestreng vokser opad fra peribranchialcaviteten for senere at smelte sammen over entodermrøret. Her udvikler de sig til en stor cellehob, som snart faar en spalte i sit indre, ligesom de to cellestrengene ogsaa lidt efter lidt gaar over til rør, og man har nu et ringformet *dorsalrør*, som omslutter entodermrøret paa dettes overgang til den indenfor liggende knop. Forbindelsen med peribranchialcaviteterne afsnøres, de to sidegrene og deres forbindelse under tarmlumen mister sit lumen og gaar over til nerver, medens ganglion, hypofysis og flimmergrube udvikles af nerverørets øverste del.

c. *Tarmkanalen* anlægges tidlig som to udbugtninger fra entodermrørets underside. Efterhvert som knoppen vokser, og især eftersom peribranchialcaviteterne udbreder sig i knoppens proximale del for at danne kloakken, trænges disse udbugtninger frem i den distale ende af knoppen. Ved indbugtninger af entodermrørets distale del, over og paa siderne af tarmanlægget, afsnøres dette delvis fra *gjællesækken*, idet der kun paa højre side vedligeholdes en åben communication (*oesophagus*), medens udbugtningen paa venstre side bliver til den egentlige tarm.

Som det fremgaar af ovenstaaende, sker udviklingen af knopperne hos *Pyrosoma* efter væsentlig de samme love som ogsaa er gjældende ved *Synascidiernes* knopskydning. Den ydre blære tager ingen del i knoppens udvikling; men de vigtigste organer dannes fra den indre blære.

At peribranchialcaviteter og nervesystem ikke, som hos *Synascidierne* dannes ved en simpel udbugtning af den indre blæres væg, men ved at kun en liden del af væggen bugter sig ud, finder sin forklaring i cellelagenes store tykkelse.

Dette, at cellevæggene beholder sin tykkelse frem gennem knoppens udvikling, istedet for som hos *Distaplia* at trækkes ud til lavt cylinder- eller pladeepithel, gjør undersøgelsen af *Pyrosoma* meget vanskelig, da væggene af de forskellige organer derved, specielt i knoppens dorsale parti, kommer til at ligge tæt op til hinanden. Uheldig

tracted. The peribranchial cavities play an important part in the developmental history of the bud, inasmuch as besides forming the origin of the *nervous system* (see below), they also form the *cloaca*, and share in the formation of the *branchial stigmata*.

b. The *nervous system*, which is formed from the peribranchial cavities in the following manner. These cavities, which in previous stages were quite separate, are connected by a tube beneath the endodermal tube on the dorsal side of the bud; while at the same time a process-like cellular cord grows upwards on each side from the peribranchial cavity, the two cords merging into one later on above the endodermal tube. There they develop into a large cellular mass, inside which a cleft soon appears, while the two cellular cords also change gradually into tubes; and there is now an annular *dorsal tube*, surrounding the endodermal tube on its passage to the bud lying within. The connection with the peribranchial cavities is broken off, the two lateral rami and their connection under the intestine lose their lumen, and become nerves, while the ganglion, the hypophysis and the dorsal tubercle are developed from the upper part of the nerve tube.

c. The *intestinal canal* commences to form early in the shape of two evaginations from the inferior side of the endodermal tube. As the bud grows, and especially as the peribranchial cavities expand in the proximal part of the bud to form the cloaca, these evaginations are forced forwards into the distal end of the bud. By the pressing in of the distal portion of the endodermal tube above, and at the sides of the rudimentary intestine, the latter is partially separated from the branchial sac, an open communication (the *oesophagus*) being maintained only on the right side, while the evagination on the left side becomes the intestine proper.

As will be seen from the above, the development of the buds in *Pyrosoma* proceeds according to the same laws as those which govern gemmation in the *Synascidiæ*. The outer vesicle has no share in the development of the bud, but the most important organs are formed from the inner vesicle.

The fact that the peribranchial cavities and the nervous system are not formed, as in the *Synascidiæ*, by a simple evagination of the wall of the inner vesicle, but that only a small portion of the wall bulges out, is explained by the great thickness of the cellular strata.

As the cell walls retain their thickness throughout the development of the bud, instead of being drawn out, as in *Distaplia*, to low cylindrical, or flattened-epithelium, the examination of *Pyrosoma*, is attended with much difficulty, for the walls of the different organs, especially in the dorsal part of the bud, at last lie close up to one an-

konservering af kolonien, eller en eller anden liden feil i knoppens behandling er da tilstrækkelig til at bringe forvirring i organernes begrænsning. Naar dertil kommer, at udviklingen af nervesystemet foregaar meget hurtig, saa man maa have en særdeles tæt række stadier for at kunne følge udviklingens gang, saa tror jeg heri at finde forklaringen til de afvigende resultater af *Seeligers* og mine undersøgelser.

At udviklingen af de fire første ascidiozoider paa den ene side og de senere anlagte knopper paa den anden skal foregaa efter forskellige love, idet nerverøret hos de første anlægges fra ektodermen (Salensky), er, som sagt, fra et theoretisk synspunkt meget overraskende, da der jo i begge tilfælde er tale om en knopskydning, og da de udviklede dyr har fuldstændig samme bygning, hvad enten de er anlagt paa den ene eller anden maade. Da mit materiale ikke har egnet sig for en indgaaende undersøgelse over knopskydningen fra cyathozoiderne, kan jeg dog endnu ikke udtale mig om dette forhold; men jeg haaber senere at kunne gjenoptage undersøgelsen.

other. Imperfect preservation of the colony, or some slight mistake in the treatment of the bud, is then sufficient to bring confusion into the definition of the organs. When to this is added the rapidity with which the development takes place thus necessitating a close series of stages in order to be able to follow its course, I think an explanation is supplied for the difference between the results of *Seeliger's* and my own investigations.

As before said, it is, from a theoretical point of view, very surprising that the development of the first four Ascidiozoids on the one side, and that of the later developed buds on the other, follow different laws, the nerve tube in the former originating in the ectoderm (Salensky); for in both cases it is a question of gemmation, and the animal developed is of exactly the same structure, whether it originates in the one way or the other. As, however, my material was not adapted to a thorough investigation of gemmation from the Cyathozoid, I cannot as yet express any opinion with regard to this circumstance, but I hope at some future time to be able to resume the investigation.

### Litteratur.

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6. *Joliet*, Etudes anatomiques et embryogéniques sur le Pyrosoma giganteum. Paris. 1888.

## Figurforklaring.

For samtlige fig. gjælder følgende betegnelser:

<i>Eg</i> = Egestionsaabning,	<i>Ks</i> = Gjællespalte,
<i>Ekt</i> = Ektoderm,	<i>Ing</i> = Ingestionsaabning,
<i>El</i> = Eleoblast,	<i>Mes</i> = Mesoderm,
<i>End</i> = Endostyl,	<i>Nr</i> = Nerverør.
<i>Ent</i> = Entoderm,	<i>Nv</i> = Nerve.
<i>Fl</i> = Flimmersøm,	<i>Ov</i> = Æg,
<i>G</i> = Ganglion,	<i>Pbc</i> = Peribranchialcaviteter.
<i>H</i> = Hypofysis,	<i>T</i> = Tarmanlæg.
<i>Kd</i> = Gjællesæk,	

### Tab. VII.

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Fig. 16.	Schema for knop af Stad. III.
Fig. 17, 18.	Snit gennem knop af samme stad.

### Tab. VIII.

Fig. 19.	Schema for knop af Stad. IV.
Fig. 20—25.	Snitserie gennem knop af samme stad.
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Fig. 34—37.	Snitserie gennem en saadan knop.

## Explanation of the Figures.

The following lettering is used in all the figures:

<i>Eg</i> = atrial aperture,	<i>Ks</i> = branchial stigmata.
<i>Ekt</i> = ectoderm.	<i>Ing</i> = oral aperture,
<i>El</i> = elæoblast,	<i>Mes</i> = mesoderm.
<i>End</i> = endostyle,	<i>Nr</i> = nerve tube,
<i>Ent</i> = endoderm,	<i>Nv</i> = nerve,
<i>Fl</i> = peripharyngeal bands,	<i>Ov</i> = ovum,
<i>G</i> = ganglion,	<i>Pbc</i> = peribranchial cavities.
<i>H</i> = hypophysis,	<i>T</i> = rudimentary intestine.
<i>Kd</i> = branchial sac.	

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Fig. 7.	Diagram of a bud in Stage I.
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Figs. 9—15.	Series of sections through a bud in the same stage.
Fig. 16.	Diagram of a bud in Stage III.
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Fig. 19.	Diagram of a bud in Stage IV.
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Figs. 34—37.	Series of sections through such a bud.





DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

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# ZOOLOGI.

KIMBLADSTUDIER

PAA GRUNDLAG AF

ASCIDIERNES UDVIKLING.

AF

JOHAN HJORT.

MED 4 TAVLER.



---

CHRISTIANIA.

GRØNDAHL & SØNS BOGTRYKKERI.

—  
1896.

THE NORWEGIAN NORTH-ATLANTIC EXPEDITION

1876—1878.

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ZOOLOGY.

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GERM-LAYER STUDIES

BASED UPON THE

DEVELOPMENT OF ASCIDIANS.

BY

JOHAN HJORT.

WITH 4 PLATES.



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CHRISTIANIA.

PRINTED BY GRØNDAHL & SØN.

1896.







I *Korschelt* og *Heiders* udmerkede „Lehrbuch der vergleichenden Entwicklungsgeschichte“ foreligger den første samlede fremstilling af Ascidiernes udvikling. Dannelsen af nye individer ved den kjønsløse forplantning, knopskydningen, antages her af *Heider* nærmest at maatte ligestilles med de i dyreriget almindelig forekommende delingsprocesser. Som hovedresultat fremgaar nemlig (pag. 1418), „dass in der Knospe keines der wichtigeren Organe neu angelegt wird, sondern dass alle wichtigeren Organanlagen aus dem Mutterthier in den Stolo und in die Knospen übergehen, während wirkliche Neubildung von Organanlagen nur im Embryo stattfindet“.

De senere aar har nu i væsentlig grad beriget litteraturen over de sammensatte Ascidiernes knopskydning. Medens *Salensky*, *Pizon* og *Garstang* har sluttet sig til den ovennævnte væsentlig paa ældre arbejder begrundede opfatning, har forfatteren, *Seeliger*, *W. E. Ritter* og *Caullery* hævdet et væsentligt andet synspunkt for den hele udviklingsproces. En række undersøgelser over knopskydningen hos forskellige familier førte mig til den opfatning, at det væsentlige og karakteristiske ved knopskydningen netop bestaar deri, at den er en nydannelse af alle organer ud fra et anlæg, der er saa primitivt som den embryonale udviklings aller tidligste stadier.

En af de væsentligste aarsager til, at saa forskellige meninger kan staa over for hinanden, ligger efter min tro i en forskellig opfatning af fundamentale udviklingsprinciper, specielt da kimbladernes udviklings-mekaniske og fylogenetiske betydning. Opfatter man nemlig knopskydningen som en nydannelse, saa maa det anlæg, hvormed knopudviklingen begynder, være et primitivt, „undifferentieret materiale“, og da dette igjen udgaar fra larvens kimblade, faar knopskydningen ogsaa betydning for den embryonale udviklings mekanik.

Af hensyn til spørgsmaalets theoretiske rækkevidde har jeg derfor troet det paakrævet at søge at give en samlet fremstilling af knopskydningen og de dermed sammenhængende embryologiske spørgsmaal ud fra mit synspunkt, og er det mit haab, at et saadant forsøg paa en gennemført fremstilling iallefald vil stille problemet i et klarere lys.

Det er hermed ikke min mening at ville give en udtømmende fremstilling af Ascidiernes udviklingshistorie i almindelighed. Min opgave vil derimod være den, at give

The first complete account of the development of Ascidians is found in *Korschelt* and *Heider's* excellent „Lehrbuch der vergleichenden Entwicklungsgechichte“. *Heider* here considers that the formation of new individuals by means of sexless propagation, or gemmation, should be compared with the commonly-occurring fission processes in the animal kingdom. It appears, as the chief result (p. 1418), „dass in der Knospe keines der wichtigeren Organe neu angelegt wird, sondern dass alle wichtigeren Organanlagen aus dem Mutterthier in den Stolo und in die Knospen übergehen, während wirkliche Neubildung von Organanlagen nur im Embryo stattfindet.“

Recent years have appreciably enriched the literature on the subject of the gemmation of Compound Ascidians. While *Salensky*, *Pizon* and *Garstang* have agreed with the above-mentioned theory, which is founded for the most part on older works, the present writer, *Seeliger*, *W. E. Ritter* and *Caullery* have maintained an essentially different view of the whole developmental process. A series of investigations of gemmation in the various families led me to the view that the essential and characteristic point in gemmation is that it is a new formation of all the organs from a rudiment as primitive as the very earliest stages of embryonic development.

One of the principal reasons why such different opinions can exist simultaneously, is found, I think, in a different comprehension of the fundamental principles of development, and especially of the developmental-mechanical and phylogenetic importance of the germ-layers. For if gemmation be considered as a new formation, the rudiment with which the bud-development begins must be a primitive „undifferentiated material“; and as this again issues from the germ-layers of the larva, gemmation also has its importance in the mechanism of the embryonic development.

Out of regard to the theoretical scope of this question, I have therefore felt drawn to attempt to give a complete account of gemmation and its dependent embryological questions, from my point of view; and it is my hope that such an attempt at a complete account, will at any rate place the problem in a clearer light.

At the same time, it is not my intention to give an exhaustive account of the Ascidiens' developmental history in general. My aim, on the contrary, will be to review

en kritik af, hvad der nu foreligger til belysning af de ovenfor antydede udviklingshistoriske spørgsmaal. Saavel i teksten som i de i dette arbeide afbildede figurer vil jeg da tildels benytte andres undersøgelser, nemlig hvor disse synes mig at være afgjørende, derhos vil jeg imidlertid ogsaa meddele egne og nye undersøgelser; idet mit maal stadig vil være at fremstille de synspunkter, der har bevæget mig til at opfatte den eiendommelige knopskydning som en nydannelse, som en epigenetisk udviklingsproces.

what now exists to throw light upon the above-referred to developmental-historical questions. Both in the text and in the figures in this paper, I shall make partial use of the investigations of others, — namely where such investigations seem to me conclusive, — besides imparting the results of new personal investigations, my aim being continually to state the circumstances which have induced me to regard the peculiar process of gemmation as a new formation, an epigenetic developmental process.



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- Kap. 3. Organdannelsen hos knopperne.

## Almindelig Del.

- Kap. 4. Sammenligning mellem larve- og knopudviklingen.
- Kap. 5. Asciernes knopskydning og kimbladkæren.
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- Chap. IV. Comparison between Larval and Bud Development.
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## Speciel Del.

### Kap. 1.

#### Af Ascidiernes embryonaludvikling.

I dette kapitel vil jeg først skitsere embryonaludviklingens vigtigste træk og dernæst mere indgaaende behandle enkelte punkter, nemlig centralnervesystemets, peribranchialsækkens og epicardiets dannelse, der er af speciel betydning for en sammenligning mellem larve- og knopudviklingen.

Ascidiernes æg er, som bekendt, særdeles forskellige hos de forskellige grupper, der findes alle overgange fra det lille protoplasmarige og blomfefattige æg hos en *Ascidia* eller *Cynthia* til det store og blomferige æg hos en *Distaplia magnilarva*.

Furingen er overalt total, men synes forøvrig at frembyde forskelligheder hos de forskellige grupper. Efter de nyere, indgaaende undersøgelser af *Castle* (8), der endnu kun foreligger som foreløbig meddelelse, synes de tidligere undersøgelser over furingen af *van Beneden og Julin* (3)\*) samt *Seeliger* (58) ikke endelig at have fastslaaet furingens love. Vi nævner derfor alene, at furingen fører til et blastulastadium, der er en „linseformet Plakula“, hvori de høje „entodermceller“ (rigtigere celler, der senere bliver entodermceller) „Haubenförmig“ omgives af de mindre ectodermceller (*Korschelt-Heider*). Gastrulationen skildrer *Heider* som „eine Einkrümmung des zweischichtigen Embryoes“, „wobei die Abflachung des Entodermfeldes in eine Einstülpung übergeht, während die Entodermis sich immer mehr an der Oberfläche des Embryos ausbreitet. Man hat daher vielfach die Gastrulation der Ascidien als eine Zwischenform zwischen der epibolischen und der Invaginationsgastrula hingestellt“. Vi vil med *Korschelt og Heider* illustrere de første udviklingsstadier med tekstfigurer fra *van Beneden og Julins* mesterlige undersøgelser over *Clavelina Rissoana* (3). Figurerne 1 og 2 viser to gastrulastadier i mediansnit.

\*) Se desuden: La segmentation chez les Ascidies et ses rapports avec l'organisation chez la larve. Arch. biol. Tome V.

## Special Section.

### Chapter I.

#### On the Embryonic Development of Ascidians.

In this chapter I will first sketch the most important features of embryonic development, and then treat more fully of the different points, viz. the formation of the central-organs of the nervous system, the peribranchial cavity, and the epicardium, this being of special importance in a comparison of the larval development with that of the bud.

The ova of Ascidians are, as is well known, very different in the different groups. All varieties are to be found, from the little protoplasmic, yolk-deficient ovum of an *Ascidia* or *Cynthia*, to the large, abundantly-yolked egg of a *Distaplia magnilarva*.

Segmentation is everywhere complete, but seems also to present differences in the different groups. According to *Castle's* (8) recent careful investigations, which yet form only a preliminary statement, *van Beneden and Julin's* (3)\*) previous investigations, as also those of *Seeliger* (58) on the subject of segmentation, do not seem to have finally established its laws. We therefore only affirm that segmentation leads to a blastula stage, which is a „lenticular placula“, in which the high „endoderm cells“ (more correctly the cells which subsequently become endoderm cells) are „Haubenförmig“ surrounded by the smaller ectoderm cells (*Korschelt-Heider*). *Heider* describes gastrulation as „eine Einkrümmung des zweischichtigen Embryoes“, „wobei die Abflachung des Entodermfeldes in eine Einstülpung übergeht, während die Entodermis sich immer mehr an der Oberfläche des Embryos ausbreitet. Man hat daher vielfach die Gastrulation der Ascidien als eine Zwischenform zwischen der epibolischen und der Invaginationsgastrula hingestellt“. We will, with *Korschelt and Heider*, illustrate the first stages of development with text-figures from *van Beneden and Julin's* masterly researches on *Clavelina Rissoana* (3). Figs. 1 and 2 show median sections of two gastrula stages.

\*) See also: La segmentation chez les Ascidies et ses rapports avec l'organisation chez la larve. Arch. biol. Tome V.

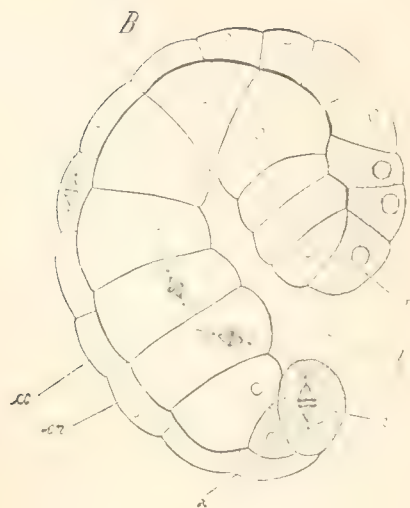


Fig. 1

Fig. 1 efter *van Beneden* og *Julin*, af *Korschelt-Heider's* lærebog.

cc = ectoderm, en = endoderm, b = blastoporus, ch = anlægget til chorda, n = anlægget til centralnervesystemet.

Begge figurer viser tydelig den typiske gastrulaform. Fig. 2 fremstiller et noget ældre stadium end fig. 1, og her er gastrulamunden bleven væsentlig mindre. Man iagttager desuden her, at enkelte celler, ch, har begyndt at sondre sig som det første, fælles anlæg til chorda og mesoderm, medens desuden i ectodermen de celler, der omgiver gastrulamunden, viser sig som det første synlige anlæg til centralnervesystemet, medullarpladen. Den videre udvikling illustreres nu af figurerne 3—5, der ligeledes fremstiller mediansnit af 3 forskellige stadier.



Fig. 2.

Fig. 1, after *van Beneden* and *Julin*, from *Korschelt-Heider's* text-book.

Fig. 2, after *van Beneden* and *Julin*, from *Korschelt-Heider's* text-book.

cc = ectoderm, en = endoderm, b = blastopore, ch = incipient notochord, n = incipient central organs of nervous system.

Both figures show distinctly the typical gastrula form. Fig. 2 represents a rather more advanced stage than fig. 1, and the gastrula aperture has become virtually smaller. It will also be observed here that certain cells, ch, have begun to separate themselves as the first common rudiments of the notochord and mesoderm, while in the ectoderm, the cells surrounding the gastrula aperture appear as the earliest visible rudiments of the central organs of the nervous system, the medullary plate. The further development is illustrated by figs. 3—5, which also represent median sections of 3 different stages.



Fig. 3.

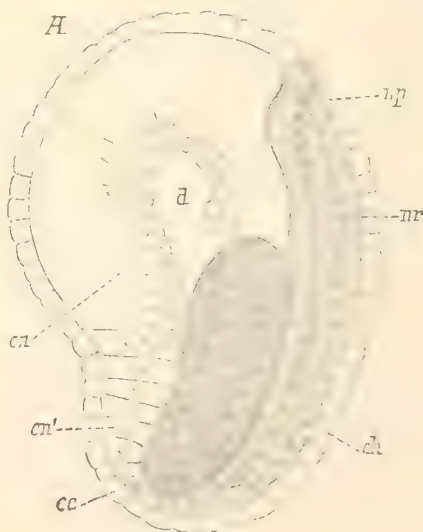


Fig. 4.

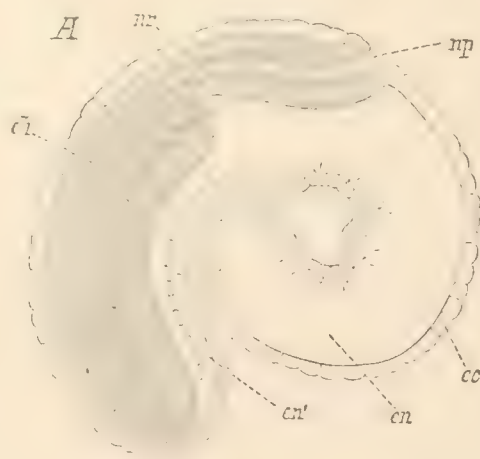


Fig. 5.

Figs. 3, 4 og 5 efter *van Beneden* og *Julin* af *Korschelt-Heider's* lærebog. cc = ectoderm, en = endoderm, d = tarmcavitet, ch = anlæg til chorda, n = anlæg til centralnervesystem, np = neuroporus.

Figs. 3, 4 and 5 after *van Beneden* and *Julin* from *Korschelt-Heider's* text-book. cc = ectoderm, en = endoderm, d = intestinal cavity, ch = rudiment of notochord, n = rudiment of central organs of nervous system, np = neuropore.



Udviklingens videre forløb er nu i hovedtrækkene følgende. Medullarpladen hæver sig bagtil og til siderne af gastrulamunden i form af medullarvulsten, der først vokser over gastrulamunden (Fig. 3) og saa videre fremover mod gastrulaens forende, idet samtidig gastrulamunden rykker indad (ventralt og bagtil) Fig. 4, 5. Medullarrøret forbliver herunder stadig aabent fortil og fortsætter sig bagtil i gastrulamunden, *canalis neuentericus*.

Det nævnte fælles anlæg for mesoderm og chorda (Fig. 3) deler sig nu i mesodermcellerne lateralt og chorda i midten. Chorda rykker endvidere stadig længere bagover idet samtidig larvens bagerste kropsparti smalner sterkt af til dannelse af halen (Fig. 4 og 5). Entodermen begrænser herved væsentlig til det forreste kropsparti, hvorfra siden hele tarmlækket og gjæletarmen dannes, medens halen af de oprindelige entodermelementer kun indeholder anlægget til chorda, og en encellet tynd ventral entodermstreng (*en*) (for ikke at nævne mesodermelementerne, der danner halens muskulatur).

Efter denne beskrivelse vil ogsaa det efter *v. Davidoff* afbildede stadium af *Distaplia magnilarva*, Pl. XII, fig. 1, være forstaaeligt. Man iagttager her dorsalt medullarrøret, fra hvis bagre parti en tildels lukket *canalis neuentericus* gaar over i den flercellede entoderm, anlægget til halen, chorda o. s. v.

Vi vil da efter denne skitse kunne omtale organdannelsen hos larven og begynder med *centralnervesystemet*.

Paa Planché XII findes afbildet en række stadier af nervesystemets udvikling hos *Distaplia magnilarva*. De første stadier, der paa det omhyggeligste er undersøgt af *v. Davidoff*, har jeg derfor ingen fornyet undersøgelser underkastet, saa meget mere som *v. Davidoff*'s resultater stemmer paa det bedste overens med undersøgelser hos andre grupper. Man iagttager paa *v. Davidoff*'s figur, Pl. XII, fig. 2, at medullarrøret lukker sig fortil og derved helt løsriver sig fra ektodermen. Det er altsaa paa dette stadium et dorsalt rør beliggende i larvens længdeakse mellem ektoderm og entoderm. Bagtil hænger det endnu sammen med den caudale fortsættelse af tarmlækket, *canalis neuentericus*. Et noget ældre stadium seet fra dorsalsiden (ovenifra) er efter egne undersøgelser afbildet Pl. XII, fig. 3. Man gjenkjender her medullarrøret, der er beliggende mellem de to anlæg til peribranchialsækken (Ektodermen kunde ikke indtegnes og maa tænkes fjernet). Medullarrøret viser her et bestemt begrændset forreste parti, anlægget til „hjerneblæren“, „sandseblæren“, „larvehjernen“, der allerede viser sig svagt antydning paa fig. 2, og et bagre parti, et fint rør. Hjerneblæren viser paa sin høire side en tydelig udbugtning, af hvilken siden den egentlige larvehjerne fremgaar. Den venstre væg viser en svag fortykkelse, den første antydning til det „blivende“, „definitive ganglion“, der, som bekendt, udgjør centralnervesystemet

The principal features in the further course of development are as follows. The medullary plate rises behind and at the sides of the gastrula aperture in the form of medullary ridges, which first grow over the gastrula aperture (fig. 3), and then forwards towards the anterior end of the gastrula, the gastrula aperture at the same time moving inwards (ventrally and backwards) (figs. 4, 5). The medullary tube meanwhile remains open in front, and is continued backwards in the gastrula aperture, the *neuenteric canal*.

The before-mentioned common rudiment of the mesoderm and the notochord (fig. 3) is now divided laterally into mesoderm cells, with the notochord in the middle. The latter continues to move farther back, while at the same time the hindmost portion of the larva's body tapers rapidly to form the tail (figs. 4, 5). The endoderm is thus virtually confined to the fore part of the body, from which the whole alimentary canal, and the branchial gut are subsequently formed, while, of the original endoderm elements the tail only contains the rudiment of the notochord and a thin, simple-celled, ventral endodermal cord (*en*), not to mention the mesoderm elements that form the musculature of the tail.

After this description, *v. Davidoff*'s *Distaplia magnilarva* stage, shown on Pl. XII, fig. 1, will also be intelligible. Here the medullary canal is seen dorsally, a partially-closed *neuenteric canal* passing from its hinder part into the many-celled endoderm, the rudiment of the tail, notochord, etc.

After this sketch, we shall be able to describe the formation of the organs in the larva, beginning with the central organs of the nervous system.

On Pl. XII will be found represented a series of stages in the development of the nervous system in *Distaplia magnilarva*. As the earlier stages have been most carefully observed by *v. Davidoff*, I have not subjected them to any renewed investigation, particularly as *v. Davidoff*'s results agree perfectly with investigations in other groups. It will be observed in *v. Davidoff*'s figure, Pl. XII, fig. 2, that the medullary canal is closed anteriorly, and is thus completely detached from the ectoderm. There is also, at this stage, a dorsal tube situated in the great axis of the larva, between the ectoderm and the endoderm. Posteriorly, it is still attached to the caudal continuation of the intestine, the *neuenteric canal*. On Pl. XII, fig. 3, a rather more advanced stage, seen from the dorsal side (above), is represented after personal observations. Here the medullary canal is recognisable, situated between the two rudiments of the peribranchial cavity. (The ectoderm could not be included, and must be considered as removed). The medullary canal here shows a distinctly defined anterior part, the rudiment of the „cerebral vesicle“, the „sensory vesicle“ or the „larval brain“, which is already faintly indicated in fig. 2; and a posterior part, a thin tube. The cerebral vesicle exhibits, on its right side, a distinct protuberance, from which the true larval brain subsequently makes its appearance. The left wall shows a

hos de stadier, der har gennemgaaet metamorphosen. Bagtil viser medullarrøret endnu paa dette stadium (fig. 3) en sammenhæng med entodermen, nogen aaben canalis neurentericus eksisterer ligesaa lidt som paa det i fig. 2 afbildede stadium.

Et følgende stadium er fremstillet ved figurerne 5 og 6 (Pl. XII); fig. 5 viser en larve seet fra dorsalsiden, fig. 6 en larve seet fra venstre side. Paa dette stadium finder vi flere vigtige forandringer. Bagtil har medullarrøret helt løst sig fra forbindelsen med entodermen, fortil er det vokset sammen med den fortykkede forreste del af gjæletarmen, der danner ingestionsaabningen, paa overgangsstedet mellem ektoderm og entodermen. Paa dette stadium findes der imidlertid ingen forbindelse mellem gjæletarmen og medullarrøret, der er altsaa kun en sammenvoksning af deres vægge. Forøvrig viser hjerneblæren sig væsentlig mere differentieret; udbugtningen af den høire væg er større og vi finder her allerede ganske store pigmentflekker; fortykkelsen af venstre væg nærmer sig halvkugleformen. Larverne er ogsaa i andre henseender væsentlig mere udviklede paa dette stadium; peribranchialsækken er dannet ved sammenvoksning af de to anlæg, og istedetfor de faa gjællespalter, der observeres paa fig. 3 *a* har vi nu 4 rækker færdigdannede gjællespalter; desuden viser ingestions- og egestionsaabningerne sig at være dannede.

Figureerne 7 og 9 (Pl. XII) viser os nu et stadium, der repræsenterer den voksne larve. Medullarrøret er her blevet meget mindre; fortil har der dannet sig en aabning fra medullarrøret til gjæletarmen og den forreste del af medullarrøret viser sig omdannet i den tragtformige flimmergrube. Hjerneblærens larvehjerne, som vi saa dannes ved en udbugtning af den høire væg, har nu helt naaet sin høieste udvikling. Man iagttager de store pigmentflekker, de 3 bekjendte linseceller; paa fig. 9 ser man fremdeles, hvorledes der fra larvehjernens ventrale væg udgaar en stor nervemasse, der er forsynet med spredte ganglieceller (først beskrevet af *Salensky*).

Det er almindelig bekjendt, at denne Ascidiehjernens høie organisation kun varer i larvestadiet og forsvinder under metamorphosen. Fig. 8 (Pl. XII) viser os centralnervesystemet hos det unge fastsiddende dyr. Man gjenkender her den sidste rest af medullarrøret som det bekjendte Ascidieorgan, der har faaet navnet Hypophysis (eller rettere Flimmergrube + Hypophysis). Gangliet finder vi beliggende ved siden af hypophysen\*), medens „larvehjernen“ helt er forsvunden. I et tidligere arbejde har jeg (31) indgaaende beskrevet larvehjernens bygning og forklaret, hvorledes dens forsvinden fremkaldes ved en afsnøring af den blæreformig udbugtede høire væg af det oprindelige medullarrør. Efter afsnøringen antager da dette ligesom foran og bag larvehjernen formen af et cylindrisk rør (fig. 8, Pl. XII).

\*) Som bekjendt er gangliets beliggenhed i forhold til hypophysen forskjelligt hos forskjellige grupper.

slight thickening, the earliest indication of the „permanent“ „definitive ganglion“, which, as is well known, forms the central organs of the nervous system, in those stages which have undergone metamorphosis. At this stage (fig. 3), the medullary tube still exhibits posteriorly a connection with the endoderm, and an open neurenteric canal no more exists than in the stage figured in fig. 2.

A subsequent stage is represented in figs. 5 and 6 (Pl. XII), fig. 5 showing a larva viewed from the dorsal side, fig. 6, a larva viewed from the left side. At this stage we find several important changes. The medullary tube has quite broken off its connection with the endoderm posteriorly, while anteriorly it has coalesced with the thickened fore part of the branchial gut, which forms the oral aperture, at the place of transition from the ectoderm to the endoderm. At this stage, however, there is no communication between the branchial gut and the medullary tube, only a symphysis of their walls. Besides this the cerebral vesicle appears more differentiated; the protuberance of the right wall is larger, and we already find quite large spots of pigment: the thickening of the left wall approximates a hemispherical form. The larvæ are more developed at this stage in other respects too; the peribranchial cavity is formed by the coalescence of the two rudiments, and instead of the few branchial stigmata seen in fig. 3 *a*, we now have 4 rows of fully-formed branchial stigmata; the oral and atrial apertures moreover appear formed.

Figs. 7 and 9 (Pl. XII) show a stage representing the full-grown larva. The medullary canal has become much smaller; in front an opening has been formed from it to the branchial gut, and the fore part of the medullary canal appears transformed into the infundibular dorsal tubercle. The larval cerebral vesicle, which, as we have seen, is formed by a protuberance of the right wall, has now attained to its full development. We observe the large spots of pigment, the 3 well-known lenticular cells. In fig. 9 it may also be seen how a large nerve-mass issues from the ventral wall of the larval brain, provided with scattered ganglion cells (first described by *Salensky*).

It is a generally-known fact that the high organisation of the Ascidian brain only lasts through the larval stage, and disappears during the metamorphosis. Fig. 8 (Pl. XII) shows the central organs of the nervous system in the young attached animal. The last remnant of the medullary tube is here recognised as the well-known Ascidian organ, that has received the name of hypophysis (or rather, the dorsal tubercle *plus* the hypophysis). The ganglion is found beside the hypophysis\*), while the larval brain has quite disappeared. In a former paper (31), I have carefully described the structure of the larval brain, and explained how its disappearance is occasioned by a constriction of the vesicularly evaginated right wall of the original medullary tube. After the separation, this organ assumes, as it were in front of and behind the larval brain, the form of a cylindrical tube (Pl. XII, fig. 8).

\*) As is well known, the position of the ganglion in relation to the hypophysis varies in different groups.



Den her givne fremstilling stemmer i de væsentligste træk med *Kowalevsky's* ældre grundlæggende undersøgelser. *Kowalevsky* skildrer (35 og 36), hvorledes der, kort efterat neuroporus har lukket sig, dannes en ny aabning fra nervesystemet (medullarrøret) ud til larvens dorsalside ved en sammenvoksning af ektodermen og hjerneblæren, samt at denne forbindelse mellem hjerneblære og ektodermen lidt efter lidt forskyves ind i gjæletarmen, idet det ektoderm-parti, der staar i sammenhæng med hjerneblæren bugter sig ind og danner larvens ingestionsaabning („fortarm“, stomodæum). „Da nun die Oeffnung des eingestülpten Theiles zum Munde wird, so bleibt die Mundung der Gehirnblase etwas tiefer und wird zu der bekannten Flimmerscheibe, von welcher aus die flimmernde Bauchrinne beginnt“ (pag. 118, 36). Det blivende ganglion og hypophysens dannelse blev ikke behandlet af *Kowalevsky*, hvilket vil forstaaes deraf, at han kun beskrev æggets udvikling indtil larvestadiet og ikke metamorphosen.

Hypophysens dannelse blev nu af *van Beneden* og *Julin* (2) samt *Seeliger* (58) skildret som helt uafhængig af medullarrøret, idet disse forfattere opfattede hypophysen som en udbugtning af gjæletarmen (entodermen). Især har *van Beneden* og *Julin* indgaaende skildret dette.

Imidlertid havde flere forfattere allerede tidligere beskrevet en forbindelse mellem larvehjernen og gjæletarmen gennem flimmergruben, saaledes hos *Ascidierne* *Lahille* (41), *Maurice* (43), *Frk. Sheldon* (63) og hos salperne *Salensky* og *Metcalf*.

Væsentlig for at vinde støttepunkter for en sammenligning mellem knopper og larver undersøgte *Willey* (65 og 67) og forfatteren (31) samtidig spørgsmaalet hos forskellige familier af *Ascidierne*, og kom herunder til identiske resultater i overensstemmelse med den ovenfor givne fremstilling.

I modsætning hertil beskriver *Pizon* (48 a og b), at der fra larvens entoderm dorsalt bugtes ud et rør, der bagfra vokser i retning forover hen til larvehjernen og munder ud i dennes sandseblære. Paa et senere stadium skal saa dette rør vokse videre forover fra larvehjernen og frem til stomodæum og saaledes i sit forreste parti danne flimmergruben. Under den senere udvikling skal forbindelsen med larvehjernen igjen løses, og røret fremstiller da hypophysen, idet dets bagre ende løser sig fra den oprindelige forbindelse med gjæletarmen. (Dette forhold paralleliserer *Pizon* med sin beskrivelse af hypophysens dannelse hos knopperne).

Det blivende ganglion dannes ogsaa efter *Pizon* fra hjerneblæren.

Den af *Willey* og forfatteren givne beskrivelse er senere bekræftet af *Salensky* (55), der har tilføiet en indgaaende beskrivelse af larvehjernens bygning, af *v. Kupffer* (40), der ligesom forf. beskrev *Distaplia magnilarva*, samt af *Caullery* (9), der undersøgte *Circinalium concrescens*, *Di-*

The description here given agrees in its principal features with *Kowalevsky's* older, fundamental investigations. *Kowalevsky* describes (35 and 36) how, shortly after the neuropore closes, a new opening is formed from the nervous system (medullary canal) out to the dorsal side of the larva by a symphysis of the ectoderm and the cerebral vesicle, and that this communication between the cerebral vesicle and the ectoderm is gradually intruded into the branchial gut, that part of the ectoderm which is in connection with the cerebral vesicle being invaginated and forming the arva's oral aperture (fore-intestine, stomodæum). „Da nun die Oeffnung des eingestülpten Theiles zum Mund wird, so bleibt die Mundung der Gehirnblase etwas tiefer, und wird zu der bekannten Flimmerscheibe, von welcher aus die flimmernde Bauchrinne beginnt“ (36, p. 118). The formation of the permanent ganglion and hypophysis was not touched upon by *Kowalevsky*, a circumstance which is explained by the fact that he only described the development of the ovum as far as the larva stage, and not to the metamorphosis.

The formation of the hypophysis was now described by *van Beneden* and *Julin* (2) and by *Seeliger* (58) as totally independent of the medullary tube, these writers having regarded the hypophysis as an evagination of the branchial gut (the endoderm). *Van Beneden* and *Julin* in particular, have described this in detail.

Several authors had, however, already described a communication between the larval brain and the branchial gut, through the dorsal tubercle, viz. *Lahille* (41) *Maurice* (43) and *Miss Sheldon* (63) in the *Ascidiae*, and *Salensky* and *Metcalf* in the *Salpæ*.

Chiefly with a view to gaining points of support for a comparison between buds and larvæ, *Willey* (65 and 67) and the present writer (31) investigated the question simultaneously, in various families of *Ascidiae*, and thereby arrived at the same conclusions agreeing with the above description.

In opposition to this, *Pizon*, (48 a and b) states that a tube bulges out dorsally from the larva's endoderm, growing from the back forwards to the larval brain, and opening into the latter's sensory vesicle. In a later stage, this tube is said to grow farther forwards from the larval brain, and on to the stomodæum, thus forming, in its anterior part, the dorsal tubercle. During subsequent development, the communication with the larval brain is again broken off, and the tube then represents the hypophysis, its hind extremity having had its original connection with the branchial gut severed. (*Pizon* compares this with his account of the formation of the hypophysis in the bud).

According to *Pizon*, the permanent ganglion is also formed from the cerebral vesicle.

The account given by *Willey* and the present writer was subsequently confirmed by *Salensky* (55), who has added a detailed description of the structure of the larval brain; by *v. Kupffer* (40), who, as well as the present writer, described *Distaplia magnilarva*; and by *Caullery*



*staplia rosea*, *Leptoclinium gelatinosum*, *Glossophorum luteum*, *Parascidia Giardii*.

Med *Caulley* maa jeg udtale, at *Pizon's* fremstilling forekommer mig vanskelig at forstaa, og, hvis den er rigtig, da dreier det sig her om en dannelse, som samtlige andre ascidieforskere har overseet, medmindre da *Pizon* med det „entodermrør“, der vokser frem fra entodermen skulde mene *canalis neurentericus*. Denne har imidlertid ingen hjerneblære at vokse hen til.

Den fremstilling, som er givet i dette arbejde hviler paa en fornyet indgaaende undersøgelse af *Distaplialarverne* og forholdene viste sig her med den størst mulige tydelighed. For at kunne vise udviklingens forløb mere anskuelig har jeg ogsaa Pl. XII afbildet flere stadier end i mit tidligere arbejde.

Jeg fastholder derfor den tidligere af *Willey* og mig givne fremstilling og rekapitulerer denne omtrent i de samme ord, som i det første arbejde.

- 1) Det larvale og det blivende centralnervesystem fremgaar hos *Distaplia* af samme anlæg som hypophysen. Dette anlæg er den oprindelige, ved udbugtning af ektodermen dannede hjerne, — resp. nerveblære (medullarrør).
- 2) Larvehjernen staar hos den voksne larve i forbindelse med gjæltarmen (overgangsstedet mellem den entodermale og ektodermale del) gennem hypofysens forreste del, flimmergruben.
- 3) Hypofysens forreste del dannes direkte af medullarrøret (foran hjerneblæren), den bagre del af hjerneblærens venstre væg. Hypofysen er derfor hos det udviklede dyr (efter metamorfosen) den eneste direkte rest af det oprindelige medullarrør.
- 4) Det blivende ganglion danner sig som en fortykkelse af hjerneblærens venstre epithelvæg.

Vi nævnte ovenfor, at idet ascidielarven efterhaanden ved en indsnøring udviklede et forreste bredere og et bagre smalere parti (halen) optraadte ogsaa de første anlæg til chorda og mesoderm. Dette foregaar paa den maade, at den oprindelig blæreformige entoderm i det smale haleparti mister sit lumen og derved gaar over til en kompakt dobbeltlaget cellemasse. Denne sonder sig nu i medianlinien, dorsalt i chorda, ventralt i den „rudimentære entodermstreng“, medens mesodermen afsondres til begge sider. (Se tekstfigurerne 2—5). Paa det i fig. 5 afbildede stadium har saaledes halen allerede i det væsentlige sin karakteristiske bygning, dorsalt en fortsættelse af medullarrøret, under dette chorda, ventralt entodermstrengen. \*)

\*) En nærmere beskrivelse af chordas udvikling og mesodermens omdannelse til muskulatur ligger udenfor vor opgave.

(9), who examined *Circinalium concrescens*, *Distaplia rosea*, *Leptoclinium gelatinosum*, *Glossophorum luteum* and *Parascidia Giardii*.

I must agree with *Caulley* in saying that *Pizon's* description seems difficult to understand, and if it is correct, there is here question of a formation, which all other investigators of Ascidians have overlooked, unless by the „entodermal tube“ growing out of the endoderm. *Pizon* means the neurenteric canal. The latter, however, has no cerebral vesicle to grow up to.

The description given in this paper is based upon a renewed thorough examination of *Distaplia* larvae, and the circumstances appeared here with the greatest possible distinctness. In order to show the course of development more plainly, I have given, on Pl. XII, a greater number of stages than in my previous paper.

I therefore hold to the account previously given by *Willey* and myself, recapitulating it almost in the words of the former paper.

- (1) The larval and the permanent nerve-centres originate in *Distaplia* in the same rudiment as the hypophysis. This rudiment is the original brain formed by an invagination of the ectoderm — nerve vesicle (medullary tube).
- (2) In the full-grown larva, the larval brain is connected with the branchial gut (the place of transition from the endodermal to the ectodermal part) through the front part of the hypophysis, the dorsal tubercle.
- (3) The anterior part of the hypophysis is formed directly from the medullary tube (in front of the cerebral vesicle), the posterior part from the left wall of the cerebral vesicle. The hypophysis in the full-grown animal (after metamorphosis), is therefore the only direct remnant of the original medullary tube.
- (4) The permanent ganglion is formed as a thickening of the left epithelial wall of the cerebral vesicle.

We mentioned above, that as the Ascidian larva, by a constriction, gradually developed an anterior broad part, and a posterior narrower part (the tail), the earliest rudiments of the notochord and the mesoderm also made their appearance. This takes place in the following manner. The original vesicular endoderm in the narrow tail portion, loses its lumen, and thus turns into a compact, bi-laminar, cellular mass. This now divides in the median line, dorsally into the notochord, and ventrally into the „rudimentary endodermal cord“, while the mesoderm is separated at both sides. (See text-figures 2—5). In the stage represented in fig. 5, the tail has already acquired its essentially characteristic structure, dorsally a continuation of the medullary canal, beneath this the notochord, and ventrally the endodermal cord. \*)

\*) A fuller description of the development of the notochord, and the conversion of the mesoderm into musculature, lies beyond the scope of our present subject.

Dannelsen af *tarmtractus* beskriver *van Beneden* og *Julin* efter en nærmere skildring af forskellige stadier paa følgende precise maade (3, pag. 325): „Il ressort avec évidence de l'étude de ces larves que le sac branchial, l'œsophage et l'estomac sont des parties différenciées de l'ébauche primitive de la larve“; (sammenlign fig. 5 den prechordale del af entodermen) „ces trois parties du tube digestif sont et restent médianes et symétriques; l'estomac, terminé en cul de sac, se prolonge en arrière par un cordon cellulaire, très court, qui n'est qu'un reste de la portion caudale du mésentéron primitif. L'intestin naît, sous la forme d'un diverticule secondaire du plancher de l'estomac, à quelque distance en avant du fond de cet organe“.

I overensstemmelse hermed betragter de endetarmen som en nydannelse (i fylogenetisk henseende), medens de mener, at endetarmen hos *Ascidierne* stamformer fortsatte sig ud i halen og at anus var beliggende ved halepartiets distale ende. Den „rudimentære entodermstreng“ i halen opfattes som et bevis herpaa.

*Peribranchialsækkens* dannelse har allerede givet anledning til talrige arbejder. Af hensyn til dette punkts store vigtighed for vor fremstilling bliver det nødvendigt at betragte denne litteratur noiere.

Det vil være almindelig kjendt, hvorledes *Kowalerskys* glimrende undersøgelser (se 35, 36) først viste nervesystemets og peribranchialsækkens anlæg, og hvorledes disse undersøgelser kastede lys over *Ascidierne* bygning, og systematiske stilling. Ligesom hos *Amphioxus* larven dannede sig nervesystemet ved en rendeformig indbugtning af ektodermen og peribranchialsækken opstod som to symmetriske blæreformige indbugtninger af ektodermen. Peribranchialsækken viste sig herved i et nyt lys, fremforalt var sammenligningen med *Amphioxus* instruktiv. Fra et anatomisk synspunkt fik disse undersøgelser en bekræftelse af *Richard Hertwig* (29) der siger: „Beim *Amphioxus* wie bei den *Tunicaten* müssen wir vorläufig annehmen, dass die in beiden die Kieme umgebende Höhle ein homologes Gebilde ist und einen Sack darstellt, der allenthalben von einem einfachen, eine Fortsetzung der Epidermis des Thieres bildenden Epithel ausgekleidet wird.“ Angaaende organets dannelse finder vi desuden: „Ich habe auf *Lessina* Gelegenheit gehabt die ersten Stadien der Larven von *Phallusia mamillata* zu beobachten, und kann bestätigen, dass die Cloakenbläschen Einstülpungen der Epidermis sind. Spätere Entwicklungsstadien zu beobachten verhinderte mich meine Abreise.“ *Della Valle* (13) har imidlertid fremsat en væsentlig anden opfatning, idet han lader *tarmtractus* (entodermen) danne to udbugtninger, der giver anledning til peribranchialsækkens dannelse. I overensstemmelse hermed har han da ogsaa en væsentlig anden opfatning af dette organ, som han tillægger den morphologiske betydning af et peritonæum, idet han nemlig gaar ud fra, at sækkens to blade, det viscerele og parietale, beklæder *tarmkanal* og *kropsvæggens* indre side som peritonæum hos *vertebraterne*.

After a detailed account of the various stages, *van Beneden* and *Julin* described the formation of the intestine in the following exact manner (3, p. 325): „Il ressort avec évidence de l'étude de ces larves, que le sac branchial, l'œsophage et l'estomac sont des parties différenciées de l'ébauche primitive de la larve“ (Compare the prechordal part of the endoderm, fig. 5); „ces trois parties du tube digestif sont et restent médianes et symétriques; l'estomac, terminé en cul-de-sac, se prolonge en arrière par un cordon cellulaire, très court, qui n'est qu'un reste de la portion caudale du mésentéron primitif. L'intestin naît sous la forme d'un diverticule secondaire du plancher de l'estomac, à quelque distance en avant du fond de cet organe.“

In accordance with this, they consider the rectum to be a new formation (phylogenetically), while they hold that that organ in *Ascidian* progenitors was continued out into the tail, and that the anus was situated at the distal end of the caudal region. The „rudimentary endodermal cord“ in the tail is considered to be a proof of this.

The formation of the *peribranchial cavity* has already been the subject of numerous papers. On account of the great importance of this point to our account, it will be necessary to consider this literature somewhat minutely.

It is generally known that *Kowalersky's* brilliant investigations (see 35, 36) first showed the rudiments of the nervous system and the peribranchial cavity, and that these investigations threw some light upon the structure and systematic position of the *Ascidians*. As in the *Amphioxus* larva, the nervous system was formed by a groove-like invagination of the ectoderm, and the peribranchial cavity originated in the form of two symmetrical, vesicular, invaginations of the ectoderm. The peribranchial cavity thereby showed itself in a new light, its comparison with that of *Amphioxus* above all being instructive. From an anatomical point of view, these investigations received confirmation from *Richard Hertwig* (29), who says: „Beim *Amphioxus* wie bei den *Tunicaten* müssen wir vorläufig annehmen, dass die in beiden die Kieme umgebende Höhle ein homologes Gebilde ist, und einen Sack darstellt, der allenthalben von einem einfachen, eine Fortsetzung der Epidermis des Thieres bildenden Epithel ausgekleidet wird.“ Concerning the formation of the organs we also find: „Ich habe auf *Lessina* Gelegenheit gehabt die ersten Stadien der Larven, von *Phallusia mamillata* zu beobachten, und kann bestätigen, dass die Cloakenbläschen Einstülpungen der Epidermis sind. Spätere Entwicklungsstadien zu beobachten verhinderte mich meine Abreise.“ *Della Valle* (31) has, however, put forward an essentially different theory, for he makes the alimentary canal (the endoderm) form 2 evaginations which give rise to the formation of the peribranchial cavity. In harmony with this, he has also an essentially different view of this organ, to which he attaches the morphological importance of the peritoneum, starting from the fact that the two layers of the cavity, the visceral and the parietal, invest the intestinal tube and the interior surface of the walls of the body as the peritoneum does in vertebrate animals.



En fornyet undersøgelse fik spørgsmaalet af *van Beneden og Julin* (3). Peribranchialsækkens dannelse skildres af dem saaledes, at det ydre blad opstaar af ektodermen, det indre af entodermen.\*) De indtager dog et væsentligt andet standpunkt angaaende peribranchialsækkens morphologiske betydning end *Della Valle*. Angaaende sammenligningen mellem coelomet hos Echinodermer, Sagitta, Amphioxus og peribranchialsækken hos Ascidierne siger de: „L'on ne peut donc comparer à ces formations les saccules latéraux qui apparaissent beaucoup plus tard dans la partie antérieure de la larve de la Clavelline aux côtés du sac branchial: ils ne contribuent en rien à la formation des tissus conjonctifs, des muscles et des éléments figurés du sang; mais ils interviennent dans la formation de l'épithélium peribranchial concurremment avec l'épiblaste.“

*Seeliger* havde imidlertid allerede tidligere (58) bekræftet *Kowalevsky's* undersøgelser og fundet, at peribranchialsækken helt var af ektodermal oprindelse. Klart fremgaar dette af følgende beskrivelse (58 pag. 83): „Die Bläschen“, der dannes ved indbugtning af epidermis, „breiten sich nun zwischen Hautschicht und den seitlichen Wandungen des Kiemendarmes beträchtlich aus, um denselben schliesslich bis zum Endostyl ventralwärts hin zu umwachsen“. „Während die beiden Peribranchialbläschen sich ausbreiten, treten sie mit ihren inneren Wänden zu dem Kiemendarm in innigste Beziehung. Es kommt nämlich zur Bildung der Kiemenspalten“. Af senere arbejder nævner jeg her fremforalt *Willey*, der bekræftede *Kowalevsky's* og *Seeliger's* fremstilling, idet han samtidig indgaaende studerede gjællepalternes dannelse (et spørgsmål, som jeg her kun leilighedsvis vil berøre). *Willey* undersøgte *Ciona intestinalis* og *Clavelina lepadiformis*. Pag. 338 (66) siger han: „From observations made on *Ciona intestinalis* and *Clavelina lepadiformis* I can confirm *Kowalevsky* and *Seeliger* in saying that the atrial cavities of Ascidians are derived essentially from ectodermic invaginations; and that the idea that the visceral wall of the atrium is derived from the hypoblast, as put forward by *van Beneden and Julin*, is entirely without foundation.“ Som nævnt i mit arbejde (31) pag. 592 har jeg haft anledning til at studere *Willeys* præparater, og der var efter min mening ingen tvivl om disses afgørende betydning for spørgsmaalet. At de vanskelige forhold under undersøgelsen let kan misforstaaes, var mig imidlertid indlysende. Betragter man *Willeys* fig. 28 Pl. XXXI (66) at, vil man indse, hvor let et saadant billede

The subject underwent renewed investigation by *van Beneden and Julin* (3). In their account of the formation of the peribranchial cavity they state that the outer layer originates in the ectoderm, the inner in the endoderm.\*) They take up an essentially different stand-point, however, from *Della Valle*, with regard to the morphological significance of the peribranchial cavity. With regard to the comparison between the coeloma in Echinoderms, Sagitta and Amphioxus, and the peribranchial cavity in Ascidians, they say: „L'on ne peut donc comparer à ces formations les saccules latéraux qui apparaissent beaucoup plus tard dans la partie antérieure de la larve de la Clavelline aux côtés du sac branchial: ils ne contribuent en rien à la formation des tissus conjonctifs, des muscles, et des éléments figurés du sang; mais ils interviennent dans la formation de l'épithélium peribranchial concurremment avec l'épiblaste.“

*Seeliger*, however, had already (58) confirmed *Kowalevsky's* investigations, and found that the peribranchial cavity was entirely of ectodermal origin. This is clearly shown in the following description (58, p. 83): „Die Bläschen“, which are formed by an invagination of the epidermis, „breiten sich nun zwischen Hautschicht und den seitlichen Wandungen des Kiemendarmes beträchtlich aus, um denselben schliesslich bis zum Endostyl ventralwärts hin zu umwachsen“. „Während die beiden Peribranchialbläschen sich ausbreiten, treten sie mit ihren inneren Wänden zu dem Kiemendarm in innigste Beziehung. Es kommt nämlich zur Bildung der Kiemenspalten.“ Among more recent writers, I would first of all name *Willey*, who confirmed *Kowalevsky's* and *Seeliger's* statements, having, at the same time, carefully studied the formation of the branchial stigmata, a subject upon which I shall only touch incidentally. *Willey* examined *Ciona intestinalis* and *Clavelina lepadiformis*. He says (66, p. 338): „From observations made on *Ciona intestinalis* and *Clavelina lepadiformis*, I can confirm *Kowalevsky* and *Seeliger* in saying that the atrial cavities of Ascidians are derived essentially from ectodermic invaginations; and that the idea that the visceral wall of the atrium is derived from the hypoblast, as put forward by *van Beneden and Julin*, is entirely without foundation.“ As mentioned in my paper (31, p. 592), I have had an opportunity of studying *Willey's* preparations, and have no doubt as to their decisive importance to the question. It was, however obvious to me that under the difficulties of investigation, circumstances may easily be misunderstood. If *Willey's* fig. 28 on Pl. XXXI

\*) Naar Herr *Seeliger* har fundet det at være af vigtighed at konstatere, at jeg i en foreløbig meddelelse har fremstillet *van Beneden og Julin* som forfægtere af peribranchialsækkens dannelse fra ektodermen, vil en læsning af mit udførlige arbejde kunne overbevise ham om, at dette ikke har beroet paa nogen „Irrthum“. Da Botryllusknoppens indre blære dannes af peribranchialsækkens parietale blad, er ogsaa efter *van Beneden og Julin's* undersøgelser Botryllusknoppen en ektodermal dannelse. At konstatere dette var mit eneste maal med en diskussion af litteraturen over peribranchialsækken.

\*) As *Seeliger* has thought it necessary to state that in a preliminary communication I have represented *van Beneden and Julin* as champions of the theory of the formation of the peribranchial cavity from the ectoderm, a perusal of my detailed paper may convince him that this is not founded upon any „Irrthum“. As the inner vesicle of the Botryllus bud is formed from the parietal layer of the peribranchial cavity, the Botryllus bud is also, according to *van Beneden and Julin's* investigations, an ectodermal formation. My only object in discussing the literature on the subject of the peribranchial cavity, was to demonstrate this.



kan tydes saaledes, at peribranchialsækken er en udbugtning af tarmen. Ved noiagtig at forfølge snitserien og fremforalt ved at sammenligne dette billede med yngre stadier, vil man imidlertid se, at *Willey's* skemata for udviklingen (pag. 325) er korrekt. Ogsaa *Seeliger* har paany (60) undersøgt spørgsmaalet hos larverne af *Clavelina lepadiformis* med samme resultat som tidligere. Hos larverne af *Distaplia* lykkedes det mig desuden at konstatere de 2 anlægs udelukkende dannelse fra ektodermen. Det forekom mig saaledes i tidligere arbejder at foreligge saa stort bevismateriale for den anskuelse, at jeg troede at kunne se bort fra *Pizon's* tilslutning til *Della Valles* ældre anskuelse, at peribranchialsækken dannes fra tarmintraktus (entodermen).

*Pizon* skildrer organets dannelse, idet han sammenligner knopper og larver, saaledes (pag. 100 48 a): „Chez les larves, les deux ouvertures se forment par un procédé tout à fait analogue“ (som hos knopperne) „mais elles naissent au fond du long sillon ectodermique, qui s'étend dorsalement d'une couverture à l'autre. Par suite si on examine seulement les coupes qui passent par l'ébauche de l'ouverture (fig. 73 à 75, pl. VI) on reconnaît en effet une invagination ectodermique profonde qui paraît prendre une part du développement de la cavité peribranchiale. Mais la suite des coupes montre bien que cette invagination épidermique n'est que le sillon qui réunit les deux ouvertures primitives, sillon qui existe avant que celles-ci ne soient formées (fig. 66 à 69, pl. V), et qui ne prend part qu'à la constitution du siphon branchial et du siphon cloacal.“

*Pizon's* figurer formaar imidlertid ikke uden videre at overbevise mig. Specielt er fig. 73 pl. VI for mig ikke bevisende. Jeg henviser til den ovenfor nævnte fig. 28 pl. XXXI hos *Willey* der ligner *Pizon's* og dog kan forstaaes paa en væsentlig anden maade. Disse *Pizon's* undersøgelser gjaldt *Botrylliderne*.

I et senere arbeide (49) har han ogsaa beskrevet lignende forhold hos andre former. Han siger (pag. 270): „Après la formation de la cavité archentérique de l'*Ascidia villosa*, les parois de cette cavité envoient latéralement deux extroflexions qui croissent assez rapidement et ne tardent pas à s'accoler chacune à l'ectoderme. Ce dernier feuillet s'invagine légèrement de son côté aux deux points de contact et s'y perce.“ „Quant aux deux diverticules de la cavité enterique, ils enveloppent progressivement en se dilatant et deviennent la cavité peribranchiale.“

Siden publicationen af dette arbeide har jeg paany undersøgt larverne af *Distaplia magnilarva*. Pl. XII, figs. 3 og 4 finder man her peribranchialsækkens dannelse illustreret og vil man heraf se, at den hos denne form fremgaar af to blæreformige ektodermindbugtninger lateralt for medullarrøret, der siden (fig. 5, 6) smelter sammen til dannelse af peribranchialsækken, som talrige forfattere har beskrevet det.

Er nu peribranchialsækken ektodermal hos *Distaplia*, *Clavelina*, *Phallusia* og entodermal hos *Botrylliderne* og *Ascidia villosa*? I tidligere arbejder tillod jeg mig at gaa

(66) be looked at, it will be understood how easily, in such a view, the peribranchial cavity can be interpreted as an evagination of the intestine. By carefully following the sectional series, however, and above all by comparing this with earlier stages, it will be seen that *Willey's* diagrams of the development (p. 325) are correct. *Seeliger* too, has again (60) investigated the subject in the larvæ of *Clavelina lepadiformis*, with the same result as before. Furthermore, I succeeded in proving the formation of these two rudiments to be exclusively ectodermic, in the larvæ of *Distaplia*. There seemed to be such ample proof of that view in earlier papers, that I felt able to be independent of *Pizon's* adherence to *Della Valle's* older theory, that the peribranchial cavity is formed from the alimentary canal (the endoderm)

*Pizon* describes the formation of the organ, comparing buds and larvæ, as follows (48 a, p. 100: „Chez les larves, les deux ouvertures se forment par un procédé tout-à-fait analogue“ (to that in the buds) „mais elles naissent au fond du long sillon ectodermique, qui s'étend dorsalement d'une couverture à l'autre. Par suite, si on examine seulement les coupes qui passent par l'ébauche de l'ouverture (fig. 73 à 75, Pl. VI), on reconnaît en effet une invagination ectodermique profonde qui paraît prendre une part du développement de la cavité péribranchiale. Mais la suite des coupes montre bien que cette invagination épidermique n'est que le sillon qui réunit les deux ouvertures primitives, sillon qui existe avant que celles-ci ne soient formées (fig. 66 à 69, Pl. V), et qui ne prend part qu'à la constitution du siphon branchial et du siphon cloacal.“

*Pizon's* figures are not however sufficient of themselves to convince me, fig. 73, Pl. VI, being especially unconvincing. I will direct attention to the above-mentioned fig. 28, Pl. XXXI, in *Willey's* book, as it resembles *Pizon's*, and yet can be interpreted in an essentially different way. *Pizon's* investigations had reference to *Botryllide*.

In a more recent work (49), *Pizon* has also described similar conditions in other forms. He says (p. 270): „Après la formation de la cavité archentérique de l'*Ascidia villosa*, les parois de cette cavité envoient latéralement deux extroflexions qui croissent assez rapidement et ne tardent pas à s'accoler chacune à l'ectoderme. Ce dernier feuillet s'invagine légèrement de son côté aux deux points de contact, et s'y perce.“ „Quant aux deux diverticules de la cavité entérique, ils enveloppent progressivement en se dilatant et deviennent la cavité péribranchiale.“

Since the publication of the above-mentioned work, I have again examined the larvæ of *Distaplia magnilarva*. On Pl. XII, figs. 3 and 4, the formation of the peribranchial cavity will be found illustrated, and it will there be seen that in this form it arises from two vesicular ectodermic invaginations laterad of the medullary tube, which subsequently coalesce (figs. 5 and 6) to form the peribranchial cavity, as numerous writers have described it.

Now, is the peribranchial cavity ectodermal in *Distaplia*, *Clavelina* and *Phallusia* and endodermal in *Botryllide* and *Ascidia villosa*? In previous papers, I ventured to

ud fra, at dette neppe kunde være muligt, idet den almindelig embryologiske *erfaring*, uanseet alle teorier, med stor styrke taler for, at i nærstaaende familier foregaar organ-dannelsen efter det samme grundskema, et forhold, som viser den eiendommelige og fundamentale overensstemmelse mellem æggene hos nærstaaende former. En eiendommelig tilslutning har imidlertid *Pizon* faaet i *Garstang*, der (18, pag. 12) siger: „It certainly seems unjustifiable on the part of *Hjort* to decline to believe *Pizon's* statements on the sole ground that in *Phallusia* and *Clavelina* the development of the peribranchial chambers takes place differently.“ At *Pizon* selv ikke stiller sig paa samme standpunkt fremgaar tydelig (48 a, pag. 380), naar han forkaster *Willeys* og mine undersøgelser, fordi de ikke stemmer med hans egne, skjont de gjaldt andre grupper. *Pizon* siger nemlig: „Je doute beaucoup de l'exactitude de ces dernières observations de *Hjort* et de *Willey*, bien que je n'aie pas étudié les larves de *Distaplia* et de *Ciona*.“ Dette *Pizon's* standpunkt er efter min opfatning ogsaa fuldt berettiget for en forsker, der føler sig overbevist om sine egne resultaters rigtighed; thi uden dette vilde den hele sammenlignende udviklingshistorie alene blive en række beskrivelser af enkelte arters udviklinger. At en sammenligning og en slutning fra den ene familie til den anden er tilladt, bestrykes ogsaa af den hele udviklingshistoriske erfaring.

Hvorledes *Garstang* ud fra sit standpunkt formaar at skrive en generel oversigt over den hele „Budding in Tunicata“, og der forkaste mine resultater som „manifestly improbable“, naar han selv overhovedet ikke har undersøgt nogen gruppes knopskydning, overlader jeg til ham at besvare. End eiendommeligere bliver det, at han anfører det forhold, at peribranchialsækken hos *Botryllus* skal være ektodermal og hos *Clavelina* og *Phallusia* entodermal for at bevise, at knoppernes indre blære altid er entodermal, og for hermed at støtte kimbladlæren! Er dette forhold rigtig, saa er vel det det haardeste stød, der nogensinde er rettet mod kimbladlæren og, som vi siden skal se, ganske anderledes afgjørende end knopudviklingen. Thi kimbladlæren gjælder larvernes udvikling, og at forskellige kimblade kan knopskyde viser ikke, at larveudviklingen er forskellig, men kun, at kimbladene maa opfattes paa en bestemt udviklingsmekanisk maade.

Er det derfor rigtigt, at peribranchialsækken hos de forskellige familier af *Ascidierne* har en forskellig dannelse, saa er dette et saa theoretisk vigtigt punkt, at det kræver den omhyggeligste og fornyede bekræftigelse, selv om det er undersøgt af en saa fremragende forsker som *Pizon*. Ingen vil derfor mere anbefale at dette sker end forfatteren. Foreløbig forekommer det mig berettiget at udtale, at særdeles talrige undersøgelser af dygtige forskere afgjørende taler for, at peribranchialsækken er en ren ektodermal dannelse, saa meget mere som *Caullery* (9) nylig har offentliggjort undersøgelser i samme retning, hvor han bekræfter dette for grupperne: „*Distaplia rosea*, *Leptoclinum gelatinosum*, *Glossophorum luteum*, og *Circinalium con-*

take it for granted that this could scarcely be possible, as general embryological *experience*, apart from all theories, goes to show very clearly that in nearly-allied families, the formation of the organs takes place according to one fundamental plan, a circumstance which shows the peculiar and fundamental conformity between the ova in nearly-allied forms. *Pizon*, however, has gained one peculiar adherent in *Garstang*, who says (18, p. 12): „It certainly seems unjustifiable on the part of *Hjort* to decline to believe *Pizon's* statements, on the sole ground that in *Phallusia* and *Clavelina* the development of the peribranchial chambers takes place differently.“ That *Pizon* himself does not always take up the same stand-point, is clear (48 a, p. 380) when he rejects *Willey's* and my investigations, because they are not in harmony with his own, although they had reference to other groups. *Pizon* says: „Je doute beaucoup de l'exactitude de ces dernières observations de *Hjort* et de *Willey*, bien que je n'aie pas étudié les larves de *Distaplia* et de *Ciona*.“ This stand-point of *Pizon's* is, in my opinion, fully justifiable in an investigator who feels convinced of the correctness of his own results; for without that, the whole developmental history would only be a series of descriptions of the development of certain species. The justifiableness of taking a comparison and a conclusion from one family for another is strengthened, too, by all developmental-historical experience.

How *Garstang* is able, from his stand-point to write a general survey of the whole „Budding in Tunicata“, and there reject my results as „manifestly improbable“, when he himself has not investigated the budding of any groups at all, I leave him to say. Yet more strange is it that he quotes the circumstance that the peribranchial cavity in *Botryllus* is ectodermal, and in *Clavelina* and *Phallusia*, endodermal, in order to show that the inner vesicle of the bud is always endodermal, and thereby to support the germ-layer theory! If this fact is correct, it is probably the hardest blow that has ever been directed against that theory, and, as we shall presently see, far more decisive than the development of the bud. For the germ-layer theory has reference to the development of the larva, and the fact that different germ-layers can bud, does not prove that the larval development is different, but only that the germ-layers must be considered in a decidedly developmental-mechanical way.

If, therefore, it is true that the peribranchial cavity in the different families of *Ascidiae* has a different formation, this is, theoretically, such an important point that it requires renewed and most careful confirmation, even if it has been investigated by so eminent a naturalist as *Pizon*. No one, therefore, will more warmly advocate this than the present writer. In the mean time, I feel justified in expressing my opinion that the great number of investigations by able anatomists speaks in favour of the purely ectodermal formation of the peribranchial cavity, the more so as *Caullery* (9) has recently published investigations in the same direction, in which he confirms this for the groups „*Distaplia rosea*, *Leptoclinum gelatino-*



*crecens*." Peribranchialsækken er her siger han: „tout entière d'origine ectodermique et se développe aux dépens de deux invaginations dorsales symétriques" (9, pag. 89). Med desto større berettigelse forekommer det mig, at det maa være mig tilladt at betragte dette som resultatet af litteraturen, som jeg selv tidligere har meddelt at have seet og bekræftet Willey's udmerkede undersøgelser, ligesom jeg i dette arbejde (Pl. XII) selv har undersøgt *Distaplia magnilarva*.

*Epicardiet* er, som bekendt, et organ, der optræder i en meget forskellig form hos de forskellige familier af de sammensatte Ascidier. Medens det, efter min formening, mangler hos gruppen *Botryllidae*, danner det skillevæggen i postabdomen hos *Polycliniderne* og stolonernes skillevæg hos *Perofora* og *Clavelina*.

Dets anatomiske bygning og dannelse har været behandlet af talrige forfattere.

*Kowalersky* meddeler, at han ikke med sikkerhed formaaede at afgjøre, fra hvilket organ epicardiet anlægges hos *Amaroucium*; han har dog vel seet det med mere end sandsynlighed, naar han siger: „Dass ihre Wandungen in die Wandungen des Kiemensackes übergehen, ist kaum zu bezweifeln, aber ob dieselben sich in die der Perithoracalhöhle zugehörigen oder in die inneren Wandungen des Kiemensackes fortsetzen, konnte ich nicht entscheiden. An jungen Knospen sind die Verhältnisse äusserst klar, und hier kann es nicht dem geringsten Zweifel unterliegen, dass die Scheidewand" (Epicardiet) „eine unmittelbare Fortsetzung der inneren Wandungen des Kiemensacks ist; aller Wahrscheinlichkeit nach müssen dieselben Verhältnisse auch bei dem ausgewachsenen *Amaroucium* angenommen werden" (38, pag. 462). Hos *Perofora* beskriver han epicardiet (stolonernes skillevæg) som „une saillie considérablement aplatie du sac branchial ou, d'une manière plus générale du tube digestif" (37, pag. 3).

*Van Beneden* og *Julin* underkastede epicardiets dannelse et meget nøie studium (3). Paa deres planche X Fig. 1 a—1 f, der ogsaa findes afbildede i Korschelt og Heiders lærebog pag. 1376, findes epicardiet paa det utvetydigste afbildet som en dobbelt cylinderformig udbugtning af tarmen, der bagtil smelter sammen til et langt rør (stolonernes skillevæg). Pag. 297 (3) skildres epicardiet saaledes: „L'organe épicaudique se constitue d'une cavité terminée en cul de sac en arrière, se bifurquant en avant en deux branches qui s'ouvrent l'une et l'autre par des orifices distincts, dans le sac branchial. La paroi épicaudique est formée par un épithélium plat, qui se continue, au niveau des orifices épicaudiques avec l'épithélium branchial. Ces orifices se trouvent placés entre l'entrée de l'œsophage et l'extrémité postérieure de la gouttière hypobranchiale, à droite et à gauche de la ligne médiane" (pag. 297). Jeg har anført dette citat saa udførligt, fordi det giver den mest mulig instruktive beskrivelse af epicardiets bygning. *Van Beneden* og *Julin* paaviste nu endvidere, hvorledes epicar-

*sum*, *Glossophorum luteum*, and *Circinalium conerescens*." The peribranchial cavity here, he says, is „toute entière d'origine ectodermique, et se développe aux dépens de deux invaginations dorsales symétriques" (9, p. 89). I think I may, with so much the more justification, be allowed to regard this as the result of bibliography, from having previously recorded the seeing and confirming of Willey's excellent observations, and having also investigated *Distaplia magnilarva* myself, the results of these investigations being given in the present paper (Pl. XII).

The *epicardium*, as is well known, is an organ which appears in very different forms in the various families of the Compound Ascidians. While, in my opinion, it is absent in the group *Botryllidae*, it forms the septum in the post-abdomen in *Polyclinidae*, and the septum of the stolons in *Perophora* and *Clavelina*.

Its anatomical structure and formation have been treated of by numerous writers.

*Kowalersky* states that he did not succeed in deciding with certainty from which organ the epicardium originates in *Amaroucium*; he must, however, have seen it with more than probability, when he says: „Dass ihre Wandungen in die Wandungen des Kiemensackes übergehen, ist kaum zu bezweifeln, aber ob dieselben sich in die der Perithoracalhöhle zugehörigen oder in die inneren Wandungen des Kiemensackes fortsetzen, konnte ich nicht entscheiden. An jungen Knospen sind die Verhältnisse äusserst klar, und hier kann es nicht den geringsten Zweifel unterliegen, dass die Scheidewand" (epicardium) „eine unmittelbare Fortsetzung der inneren Wandungen des Kiemensacks ist; aller Wahrscheinlichkeit nach müssen dieselben Verhältnisse auch bei dem ausgewachsenen *Amaroucium* angenommen werden" (38, p. 462). He describes the epicardium (septum of the stolons) in *Perophora*, as „une saillie considérablement aplatie du sac branchial, ou, d'une manière plus générale, du tube digestif" (37, p. 3).

*Van Beneden* and *Julin* subjected the formation of the epicardium to very careful study (3). In their figs. 1 a to 1 f, Pl. X, which are also given in Korschelt and Heider's text-book, p. 1376, the epicardium is represented in the most unmistakable manner, as a double, cylindrical evagination of the intestine, the two parts coalescing behind into one long tube (the septum of the stolons). On p. 297 (3) the epicardium is thus described: „L'organe épicaudique se constitue d'une cavité terminée en cul-de-sac en arrière, se bifurquant en avant en deux branches qui s'ouvrent l'une et l'autre par des orifices distincts, dans le sac branchial. La paroi épicaudique est formée par un épithélium plat, qui se continue, au niveau des orifices épicaudiques, avec l'épithélium branchial. Ces orifices se trouvent placés entre l'entrée de l'œsophage et l'extrémité postérieure de la gouttière hypobranchiale à droite et à gauche de la ligne médiane." I have quoted this passage at length, because it gives the most instructive description possible of the structure of the epicardium. *Van Beneden* and *Julin*



diets fysiologiske opgave bestod i at regulere blodstrømmen i postabdomen, repektive stolonerne, idet det i disse danner en flad, dobbeltvægget skillevæg, der deler de cylindriske organer i to halvdele, desuden paaviste de ligesom *Kowalevsky*, hvilken rolle epicardiet spiller ved knopskydningen. Den i disse arbejder fremstillede opfatning er nu bleven bekræftet af flere forfattere, hvoraf jeg her nævner *Maurice* (43), der i sin fig. 66, pl. XVIII b, afbilder en larve af *Amaroucium*, hvor anlægget sees meget instruktivt. Hos *Seeliger* finder vi ligeledes den samme fremstilling af epicardiet. Jeg henviser til fig. 760, pag. 1300 i *Korschelt* og *Heiders* lærebog, hvor epicardiets udvikling hos larverne er fremstillet. Som i de tidligere nævnte afhandlinger beskrives her epicardiet som en udbugtning fra tarmltractus i dennes æsophagelparti.

I den senere tid er imidlertid et væsentlig andet standpunkt indtaget af *Pizon*. Efter hans undersøgelser skal epicardiet hos nogle grupper dannes af tarmltractus hos andre af peribranchialsækken. Hos familien *Botryllidæ* har peribranchialsækken en overordentlig udbredelse i kropshulen. (Se fig. 5, Pl. IX). Medens organet hos de fleste sammensatte Ascidier kun findes i „pars respiratoria“ af tarmltractus vokser det hos *Botrylliderne* bagover og beklæder med sit „viscerale blad“ hele tarmltractus. I et tidligere arbejde har jeg skildret dette saaledes (31, pag. 594): „Die einheitliche Peribranchialblase entwickelt sich nun derart weiter, dass sie nicht nur den Abschnitt des Kiemen-darmes, sondern den ganzen Darmtractus umwächst. *Della Valle* hat sehr korrekt beschrieben, wie das parietale Blatt der Peribranchialblase sich überall dem Ektoderm, das viscerele dem Darmtractus anlegt (s. meine Taf. 37, Fig. 4).“ *Della Valle* har kaldt peribranchialsækken for „peritoneum“ (13), en anskuelse, der efter min mening bestemt allerede er gjendreven af *Richard Hertwigs* ældre anatomiske (29) og *Kowalevsky* og *Seeligers* udviklingshistoriske arbejder. *Pizon* kalder nu den del af peribranchialsækken, der beklæder tarmltractus (bagenfor „pars respiratoria“), og som jeg alene opfatter som en for *Botrylliderne* og *Pyrosoma* eiendommelig sterk udvikling af peribranchialsækken for „la membrane périviscérale ou épicaudique.“ I et tilsvarende svar til mig siger han (48 a, pag. 376): „Ni Oka ni Hjort n'ont attribué à la cavité unique dans laquelle s'ouvrent les deux sacs peribranchiaux sa signification de cavité cloacale. Quant aux deux prolongements postérieurs de cette cavité qui sont les homologues des tubes épicaudiques des Ascidies polycliniennes, Oka seul en a constaté la présence, mais sans en voir la véritable nature.“ Det er ikke rigtig af *Pizon* at paastaa, at hvad han beskriver som „tubes épicaudiques“ ikke ligesaafuldt er afbildet og beskrevet af mig; jeg henviser alene til min fig. 5, Pl. IX, hvor det samme forhold fuldt ud er afbildet. *Salensky*, der har sluttet sig til *Pizons* opfatning, siger endogsaa: „Hjort hat offenbar die Epicardialsäcke gesehen, nur nicht als solche erkannt“ (55, pag. 524).

further demonstrated how the physiological function of the epicardium consisted in the regulation of the stream of blood in the post-abdomen, as also in the stolons, forming in them a flat double-walled septum, which divides the cylindrical organs into 2 halves. They also showed, as did *Kowalevsky*, the part that the epicardium plays in budding. The theory put forward in these works has now been confirmed by several writers, among whom I will here name *Maurice* (43), who, in his fig. 66, Pl. XVIII b, gives a drawing of a larva of *Amaroucium*, where the rudiment is very instructively shown. In *Seeliger* also, we find the same account of the epicardium. I refer the reader to fig. 760, p. 1300, in *Korschelt and Heider's* text-book, where the development of the epicardium in the larva is represented. As in the previously-mentioned treatises, the epicardium is here described as an evagination from the æsophageal part of the alimentary canal.

In more recent times, however, an essentially different stand-point has been taken by *Pizon*. According to his investigations, the epicardium in some groups is formed from the intestine, in others, from the peribranchial cavity. In the family *Botryllidæ*, the peribranchial cavity has an unusual expansion in the cavity of the body (see Pl. IX, fig. 5). While this organ in most of the Compound Ascidians is only found in the „pars respiratoria“ of the alimentary canal, in *Botryllidæ* it grows backwards and covers with its „visceral layer“ the whole of the alimentary canal. I have thus described it in a previous paper (31, p. 594): „Die einheitliche Peribranchialblase entwickelt sich nun derart weiter, dass sie nicht nur den Abschnitt des Kiemen-darmes, sondern den ganzen Darmtractus umwächst. *Della Valle* hat sehr korrekt beschrieben wie das parietale Blatt der Peribranchialblase sich überall dem Ektoderm, das viscerele dem Darmtractus anlegt (s. meine Taf. 37, Fig. 4).“ *Della Valle* has called the peribranchial cavity, the „peritoneum“ (13), a view which, in my opinion, was already confuted by *Richard Hertwig's* earlier anatomical work (29), and by *Kowalevsky's* and *Seeliger's* developmental-historical works. *Pizon* calls that part of the peribranchial cavity, which covers the alimentary canal (behind the „pars respiratoria“) and which I alone interpret as a high development of the peribranchial cavity, peculiar to *Botryllidæ* and *Pyrosoma*, „la membrane périviscérale ou épicaudique.“ In a reply to me, he says (48 a, p. 376): „Ni Oka ni Hjort n'ont attribué à la cavité unique dans laquelle s'ouvrent les deux sacs péribranchiaux sa signification de cavité cloacale. Quant aux deux prolongements postérieurs de cette cavité qui sont les homologues des tubes épicaudiques des Ascidies polycliniennes, Oka seul en a constaté la présence, mais sans en voir la véritable nature.“ *Pizon* is incorrect in maintaining that what he describes as „tubes épicaudiques“ are not quite as fully described and figured by me; I will only direct attention to my fig. 5, Pl. IX, where the same thing is shown in full. *Salensky*, who has subscribed to *Pizon's* view, even says: „Hjort hat offenbar die Epicardialsäcke gesehen, nur nicht als solche erkannt“ (55, p. 524).

I et senere arbejde har *Pizon* (49) end skarpere udtalt sin mening, idet han hos *Ascidia villosa* beskriver epicardiet saaledes: „Au moment de l'apparition des premières fentes branchiales chez l'*Ascidia villosa*, ce sac“ (epicardiet) „est encore largement ouvert, dans la cavité enterique de laquelle il dérive. Chez *Cynthia morus* l'épicarde se présente comme deux grands prolongements des sacs peribranchiaux et rappelle ainsi très-exactement la disposition, que je lui ai décrite chez les Botryllidés.“ Efter *Pizon* er altsaa hos *Polyclinum* og *Ascidia villosa* epicardiet en udbugtning af entodermen (tarmtraktus), hos *Botryllus* og *Cynthia morus* derimod er peribranchialsækken det organ, der danner epicardiet som to udbugtninger.

Jeg har ovenfor saa indgaaende behandlet disse meningsforskjelligheder mellem *Pizon* og mig, ikke for at konstatere, hvem der har havt ret, men fordi en af aarsagerne til den store difference mellem *Pizon's* og min opfatning af den hele udvikling beror paa dette punkt.

Vi saa i det foregaaende, at epicardiet (ifølge *van Beneden* og *Julin* og *Seeliger*) hos *Clavelina* samt (ifølge *Maurice*, *Kowalevsky*) hos *Amaroucium* utvivlsomt var en direkte udbugtning af tarmtraktus. Det har ogsaa lykkedes mig selv ved indgaaende undersøgelser at bekræfte dette. Paa planche X finder man en larve af *Amaroucium roseum*, fig. 6, samt et ungt dyr, pl. X, fig. 9, der netop har gennemgaaet metamorfosen og endnu ikke dannet nogen post-abdomen. Paa tværsnit lykkedes det mig her at konstatere, at det cylinderformige epicardialrør, som *van Beneden* og *Julin* saa indgaaende har beskrevet det, nær tarmtraktus deler sig i to rør, hvis epithelier umiddelbart fortsætter sig i gjæletarmens. Der kan for denne families vedkommende herom ingen tvivl næres; og maa jeg vel da være berettiget til at slutte det sammen for *Clavelinas* og *Perophoras*\*) vedkommende.

I det foregaaende saa vi fremdeles, at de dannelser, der af *Pizon* beskrives som epicardier, ogsaa var iagttaget saavel af *Oka* (45) som af mig for *Botryllus* vedkommende. Der hersker altsaa ingen meningsforskjel angaaende de faktiske forhold, kun angaaende tydingen af disse. Kan nu disse peribranchialsækudvidelser hos *Botryllus* (og *Cynthia morus*) „homologiseres“ med epicardialdannelserne hos *Amaroucium* og *Clavelina*, som jeg har beskrevet dem ovenfor?

Det forekommer mig, at dette ikke er muligt. Betragter vi for det første den morphologiske\*\*) side af spørgsmaalet, saa maa man vel indrømme, at det er en væsentlig forskjøl for et organ, om det er en udbugtning af tarmtraktus eller en udbugtning af peribranchialsækken. Jeg vil

In a later work, *Pizon* (49) expresses his opinion more clearly, when he describes the epicardium in *Ascidia villosa* as follows: „Au moment de l'apparition des premières fentes branchiales chez l'*Ascidia villosa*, ce sac“ (the epicardium) „est encore largement ouvert, dans la cavité entérique de laquelle il dérive. Chez *Cynthia morus* l'épicarde se présente comme deux grands prolongements des sacs peribranchiaux, et rappelle ainsi très-exactement la disposition que je lui ai décrite chez les Botryllidés.“ According to *Pizon*, therefore, the epicardium in *Polyclinum* and *Ascidia villosa* is an evagination of the endoderm (the alimentary canal), whereas in *Botryllus* and *Cynthia morus*, the peribranchial cavity is the organ which forms the epicardium in the shape of two evaginations.

I have thus thoroughly discussed these differences of opinion between *Pizon* and myself, not in order to prove which is right, but because one of the reasons of the great difference between *Pizon's* view of the whole development, and my own, depends upon this point.

We have already seen that the epicardium (according to *van Beneden* and *Julin*, and *Seeliger*) in *Clavelina*, and (according to *Maurice* and *Kowalevsky*) in *Amaroucium*, is without doubt a direct evagination of the alimentary canal. By thorough investigations I have also succeeded in corroborating this. On Pl. X, fig. 6 will be found a larva of *Amaroucium roseum*, (and on Pl. X, fig. 9) a young animal, which has just undergone metamorphosis, and has not yet formed any post-abdomen. In transverse sections I succeeded in demonstrating that the cylindrical epicardiac tube, as *van Beneden* and *Julin* have so minutely described it, divides, near the alimentary canal, into 2 tubes, whose epithelia are continued directly in that of the branchial sac. As far as this family is concerned, no doubt of this can be entertained; and I may therefore be justified in concluding the same with regard to *Clavelina* and *Perophora*.\*)

We see in the above that the formations described by *Pizon* as epicardia, were also observed by *Oka* (45) and myself as far as *Botryllus* was concerned. No difference of opinion therefore prevails as to the actual facts, but only as to their interpretation. Can now these expansions of the peribranchial cavity in *Botryllus* (and *Cynthia morus*) be „homologised“ with the epicardiac formations in *Amaroucium* and *Clavelina*, as I have described them above?

It seems to me that this is impossible. If, in the first place, we look at the morphological\*\*) side of the question, it must be admitted that it is an essential difference in an organ, whether it is an evagination of the intestine, or an evagination of the peribranchial cavity. I

\*) *Ritter* (50) meddeler, at hos en *Perophora*knop forblev et af peribranchialsækanlæggene i forbindelse med stolonens skillevæg, idet knoppens indre blære delte sig i tre. Jeg advarer her mod at bygge forstaaelsen af et organ paa knopskydningen, især hvor *Kowalevsky* i andre tilfælde har konstateret et andet forhold.

\*) Angaaende peribranchialsækkens dannelse i embryonaludviklingen se ovenfor.

\*) *Ritter* (50) states that in a *Perophora* bud, one of the rudiments of the peribranchial cavity remained in connection with the wall of the stolon, the inner vesicle of the bud dividing into three. I would here utter a warning against basing the comprehension of an organ on the budding, especially where *Kowalevsky* in other cases has proved a different state of the matter.

\*) Concerning the formation of the peribranchial cavity in the embryonic development, see above.



ikke lægge for stor vægt paa den særdeles karakteristiske specielle bygning (form), som Epicardiet har hos *Clavelina* og *Amaroucium*. Hovedmomentet er for mig den betragtning, at tarmlraktur og peribranchialsæk dog er saa overordentlig forskellige dannelser, og at da de udbugtninger, de danner, maa opfattes paa forskellig maade.\* Hertil kommer nu det, at epicardiet hos *Amaroucium* og *Clavelina* aldeles ikke omklæder tarmens bagre parti, men danner et ganske enkelt cylinderformigt rør, der fortsætter sig ud i postabdomen, respektive stolonerne som disse organers „skillevægge“. Fra et anatomisk synspunkt formaar jeg saaledes ikke at se nogen som helst overensstemmelse mellem disse organer. Derimod søgte jeg at forklare peribranchialsækkens store udvidelse hos *Botryllus* som en tilpasning til det forhold, der er saa karakteristiske for denne gruppe (ligesom for *Pyrosoma*), nemlig at de to aabninger, ingestions- og egestionsaabningen, rykker saa langt fra hinanden. Herved faar det parti af peribranchialsækken, som man almindelig kalder kloakken, en overordentlig storrelse. Dyret strækkes desuden, saaledes at anus i modsætning til alle andre sammensatte Ascidier næsten ligger i kropsaksens bagre pol. Paa mine figurer (31) pl. 37, fig. 1 og 4 er dette meget instruktivt fremstillet. (Se Pl. IX, fig. 5). Sammenligner man denne figur med pl. X, fig. 9, som jeg har beskrevet ovenfor, saa vil man kunne forestille sig, at naar egestionsaabningen (for tydeligheds skyld ikke indtegnet paa Pl. IX, fig. 5) rykker henimod den bagre pol af dyrets længdeakse, saa vil ogsaa peribranchialsækken (eller kloakken) faa en større udbredelse, end den har hos *Amaroucium*, hvor den er begrændset til tarmens pars respiratoria. Man vil ved denne sammenligning samtidig se, hvor forskellig en saadan udvidelse af peribranchialsækken vilde være fra epicardiet hos *Amaroucium*.

Er der nu saa store anatomiske forskelligheder hos de to dannelser, saa forekommer det mig paa forhaand vanskeligt at „homologisere“ dem af fysiologiske grunde, saa meget mere som det i den sammenlignende anatomi turde være ukjendt, at nærtstaaende familier har homologe organer af saa væsensforskellig art. Betragter vi imidlertid den fysiologiske side af spørgsmaalet, saa maa jeg først bemærke, at epicardiets opgave hos *Clavelina* og *Amaroucium* hverken er at beklæde tarmlraktur eller at være kloak. Jeg nævnte ovenfor, at *Pizon* sammenligner peribranchialsækken hos Ascidierne med *peritoneum* hos andre Dyr, en tanke, som han vel har faaet ved studiet af de eiendommelige og specifikt modificerede forhold hos *Botryllus* (ligesom *Della Valle*), og vi maa da erindre, at han baade hos knopper og larver mener, at peribranchialsækken er en udbugtning af entodermen. Selv om inidlertid saa var tilfældet, saa forekommer det mig umuligt paa nogen maade at sammenligne peribranchialsæk og et *peritoneum*, hvad ogsaa *van Beneden* og *Julin* og *Seeliger* tidligere meget distinkt har fremhævet. Et *peritoneum* er dog vel overalt en *mesodermal-dannelse*, og selv om hos *Botryllus* knopperne peribranchialsækdannelsen har en *formlighed* med *cælom-sækdannelsen* hos f. eks. *Amphioxus* eller *Sagitta*, saa er dog derfor dette organ ligesaa lidt et *peritoneum*, som skal-

will not lay too great stress upon the highly characteristic special structure (form) of the epicardium in *Clavelina* and *Amaroucium*. The chief point for me is the consideration that the alimentary canal and the peribranchial cavity are such exceedingly different formations, and that therefore the evaginations they form must be interpreted in different ways. To this must be added the fact that in *Amaroucium* and *Clavelina*, the epicardium does not encase the posterior part of the intestine at all, but forms quite a simple cylindrical tube, which is continued out into the post-abdomen, the stolons, as the walls of these organs. From an anatomical point of view, I cannot see any harmony whatever between these organs. On the other hand I have tried to explain the great expansion of the peribranchial cavity in *Botryllus* as an adjustment to the conditions so characteristic of this group (as also of *Pyrosoma*), namely, that the two apertures, the oral and the atrial are so far removed from one another. By this means, that part of the peribranchial cavity generally called the cloaca, becomes exceedingly large. The animal too is *extended* so that the anus, contrary to that of all other Compound Ascidians, lies almost in the posterior pole of the axis of the body. In my figures (31) Pl. 37, figs. 1 and 4, this is very instructively represented. (See Pl. IX, fig. 5). If we compare this figure with Pl. X, fig. 9, which I have described above, we shall be able to imagine that when the atrial aperture (for the sake of distinctness not shown on Pl. IX, fig. 5) is pushed towards the posterior pole of the long axis of the animal, the peribranchial cavity (or cloaca) will also acquire a greater extent than it has in *Amaroucium*, where it is limited to the pars respiratoria of the intestine. By this comparison it will also be seen how different such an expansion of the peribranchial cavity would be from the *epicardium* in *Amaroucium*.

If now there are such great anatomical differences in the two formations, it already seems to me difficult to „homologise“ them, for physiological reasons, the more so as, in comparative anatomy, the circumstance of nearly-allied families having homologous organs of such essentially different kinds, is probably unknown. If, however, we consider the physiological side of the question, I must first remark, that the function of the epicardium in *Clavelina* and *Amaroucium* is neither to line the intestinal region, nor to be cloaca. I mentioned above that *Pizon* compares the peribranchial cavity in the Ascidians with the *peritoneum* in other animals, an idea which he, like *Della Valle*, has probably got by the study of the peculiar and specifically modified conditions in *Botryllus*, and we must then recollect, that both in buds and larvæ, he considers the peribranchial cavity to be an evagination of the endoderm. Even if, however, such were the case, it seems to me impossible in any way to compare the peribranchial cavity and the *peritoneum*, an opinion which *van Beneden* and *Julin*, and *Seeliger* have previously emphasised very clearly. A *peritoneum* is presumably always a *mesodermal-formation*, and even in the buds of *Botryllus*, the peribranchial cavity has a similarity of *form* to the *cæloma*, e. g. in *Amphioxus* or *Sagitta*, yet this organ is not for that



kjertelen hos mollusklarven er en gastruladannelse (confer *Braem* 7). Vi har nemlig hos *Ascidie-larverne* en distinct mesodermdannelse, der intet har med peribranchialsækkens dannelse at gøre. Denne mesodermdannelse (man betragte *van Beneden and Julin's* prægtige afhandling [3]) optræder meget tidligere i udviklingen og viser stor lighed med mesodermdannelsen andetsteds, (hvad enten man nu vil antage *van Beneden og Julin's* beskrivelse af *Ascidie-larvens* cœlom-sække eller ikke). Desuden maa man dog indrømme, at peribranchialsækken er et saa distinct, specifikt organ, at det vilde være uden sammenligning i det at se en modificeret mesodermdannelse. Peribranchialsækken maa derfor overalt fra et fysiologisk synspunkt opfattes som et eget specifikt organ, og at det hos *Botryllus* beklæder tarmtraktus ogsaa udenfor pars respiratoria er ikke noget bevis for, at organet indeholder oprindelig mesodermale anlæg, men alene at forklare af kloakens store udvidelse paa grund af akseforandringer.

Ethvert holdepunkt for en fysiologisk sammenligning med epicardiet svinder nu end mere ved faktum, at epicardiet hos *Amaroucium* aldeles ikke beklæder tarmtraktus, men som et direkte cylindrisk rør fortsætter sig ud i post-abdomen. Det er overhovedet et stort spørgsmaal, hvorvidt peribranchialsækken direkte beklæder tarmtraktus selv hos *Botryllus*. Af theoretiske grunde skulde jeg være mere end tilbøjelig til at antage, at der findes fine mesodermelementer mellem de to organer; men man vil indse, hvor vanskelig det er at afgøre dette, da saavel peribranchialsækken som mesodermelementerne optræder som overordentlig flade plade-epithelier. Jeg tillader mig at anbefale dette til fornyet undersøgelse; frugtbarest vilde utvivlsomt studiet af unge larver og knopper være. (Hvad peribranchialsækkens og epicardiets forhold til knopskydningen angaar se Kap. 2).

Af den foregaaende udvikling mener jeg at kunne udlede følgende resultater:

1. Peribranchialsækken er hos *Ascidia mammillata* (*Kowalevsky*), *Clavelina* (*Seeliger*, *Willey*, *Seeliger* paany), *Ciona intestinalis* (*Willey*), *Distaplia rosea*, *Leptoclinum gelatinosum*, *Glossophorum luteum*, *Circinalium conrescens* (*Caullery*) et organ, der dannes i embryonaludviklingen ved to symmetriske ectodermudbugtninger, der siden forener sig til en fælles blære. Jeg foier hertil, at jeg kan bekræfte *Willeys* resultater, og at jeg i dette arbeide fremlægger undersøgelser i samme retning over *Distaplia magnilarva*.

2. Hvis peribranchialsækken hos *Botryllide-larverne*, som paastaet af *Della-Valle* og *Pizon* samt hos larven af *Ascidia villosa* (*Pizon*) dannes af entodermen, saa staar vi overfor det theoretisk vigtige forhold, at det samme organ hos nærstaaende grupper (familier, arter) kan dannes paa væsentlig forskjellig maade. Af hensyn til spørgsmaalets theoretiske betydning turde dette kræve fornyede undersøgelser.

reason a peritoneum any more than the shell-gland in the Mollusc larva is a gastrula formation (cf. *Braem*, 7). In *Ascidie larvæ*, we have a distinct mesodermal formation, which has nothing to do with the formation of the peribranchial cavity. This mesodermal formation (see *van Beneden and Julin's* capital treatise [3]) appears much earlier in the development, and exhibits a great likeness to the mesodermal formation in other groups (whether *van Beneden and Julin's* description of the *Ascidian larva's* cœloma be accepted or not). It must also be admitted that the peribranchial cavity is such a distinct, specific organ, that to see in it a modified mesodermal formation would be without parallel. The peribranchial cavity must therefore, from a physiological point of view, be regarded as a peculiar, specific organ; and the fact that in *Botryllus* it also lines the alimentary canal outside the pars respiratoria is no proof that the organ originally contains mesodermal rudiments, but is only to be explained by the great expansion of the cloaca on account of axial variations.

Every strong point for a physiological comparison with the epicardium vanishes yet more completely when considering the fact that the epicardium in *Amaroucium* does not line the alimentary canal at all, but is continued as a direct cylindrical tube out into the post-abdomen. It is altogether a great question whether the peribranchial cavity forms a direct lining to the intestine, even in *Botryllus*. On theoretical grounds, I should be more than inclined to suppose that there are fine mesoderm elements between the two organs; but the difficulty of settling this point will be understood, as both the peribranchial cavity and the mesoderm elements are present as exceedingly flat, stratified epithelium. I venture to recommend this question to renewed investigation. The study of young larvæ and of buds would undoubtedly be the most fruitful. (For the relations of the peribranchial cavity and the epicardium to gemmation, see Chap. II.)

From the foregoing evolution, I consider that the following conclusions may be drawn:

1. The peribranchial cavity in *Ascidia mammillata* (*Kowalevsky*), *Clavelina* (*Seeliger*, *Willey* and *Seeliger* again), *Ciona intestinalis* (*Willey*), *Distaplia rosea*, *Leptoclinum gelatinosum*, *Glossophorum luteum* and *Circinalium conrescens* (*Caullery*) is an organ formed, in the embryonic development, by two symmetrical ectodermal evaginations, which subsequently become united as a common vesicle. I would here add my confirmation of *Willey's* results, and that in the present paper I give investigations on the same subject in *Distaplia magnilarva*.

2. If the peribranchial cavity in *Botryllide* larvæ, as *Della Valle* and *Pizon* have asserted, and in the larva of *Ascidia villosa* (*Pizon*), are formed from the endoderm, we are confronted by the theoretically important circumstance, that the same organ can be formed in nearly-allied groups (families, species) in essentially different ways. The theoretical importance of this question demands renewed investigation.

3. Epicardiet er hos *Clavelina* (Seeliger, van Beneden og Julin), *Amaroucium* (Maurice, dette arbejde, Kowalevsky's formodning) bevist at være en udbugtning af tarmtraktus.

4. De at *Pizon* hos *Botryllus* og *Cynthia morus* beskrevne udbugtninger af peribranchialsækken kan derfor ikke kaldes *epicardier*. Selv om man med *Pizon* antager, at peribranchialsækken hos *Botrylluslarverne* dannes af entodermen (tarmtraktus) saa bliver derfor hverken hele peribranchialsækken eller en del (f. eks. den bagerste del) homolog med epicardiet, saaledes som vi finder det hos *Amaroucium*, dels fordi det er ukjendt, at lige organer hos nærstaaende familier anatomisk og embryonalt har saa overordentlig forskjelligt forhold, dels ogsaa fordi peribranchialsækken hos *Botryllus* i sin helhed, som kloak etc. har en funktion, der er væsensforskjellig fra epicardiets.

Angaaende dannelsen af *hjertet* og *pericardiet* henviser jeg alene til *van Beneden og Julin*, dels fordi jeg ikke selv har anstillet indgaaende studier heraf, dels ogsaa fordi dette spørgsmaal er af mindre betydning for vort egentlige maal, en sammenligning mellem knopper og larver. Jeg nævner kun, at det f. eks. af *Pizon's* senere ingaaende undersøgelser synes at fremgaa, at disse organer i larveudviklingen dannes af entodermen.

For vort maal turde det fremdeles være overflødigt at beskrive, hvorledes de saaledes anlagte organer nu udvikler sig til dannelse af den færdige Ascidie-larve saaledes som jeg har afbildet den her Pl. X, fig. 6, Pl. XII, fig. 9.

Det vil være almindelig bekjendt, at larven under „metamorphosen“ sætter sig fast og gennemgaar indgribende forandringer. Man vil erindre, at saaledes fremforalt centralnervesystemet helt omforandres, idet den larvale hjerneblære afsnøres og det blivende ganglion træder i virksomhed, at halen med dens chorda dels kastes af, dels resorberes, at sugeskaalene etc. forsvinder.

Den unge Ascidie frembyder derfor efter metamorphosen et billede som afbildet paa fig. 9, Pl. X. Man iagttager her ligesom hos larven, Pl. X, fig. 6, ingestions- og egestionsaabningerne, endostylen, gjællespalterne, samt i fig. 9 *cellulosekappen* der allerede har opnaaet en vis mægtighed. Dennes dannelse foretrækker jeg at omtale i næste kapitel.

3. The epicardium in *Clavelina* (Seeliger, van Beneden and Julin), and *Amaroucium* (Maurice, the present paper, Kowalevsky's supposition), is proved to be an evagination of the alimentary canal.

4. The evaginations of the peribranchial cavity described by *Pizon* in *Botryllus* and *Cynthia morus* cannot therefore be called *epicardia*. Even if we assume with *Pizon* that the peribranchial cavity in *Botryllus larvæ* is formed from the endoderm (alimentary canal), neither the whole nor a part (e. g. the hindmost part) of the peribranchial cavity therefore becomes homologous with the epicardium as we find it in *Amaroucium*, partly because similar organs in nearly-allied families have never been known to have conditions so exceedingly different, anatomically and embryonally; partly because the peribranchial cavity in *Botryllus*, in its entirety, as cloaca, etc. has an essentially different function to that of the epicardium.

Concerning the formation of the *heart* and the *pericardium*, I will only refer to *van Beneden and Julin*, partly because I have not myself made a thorough study of the subject, and partly because this question is of minor importance to our main object, viz. a comparison between buds and larvæ. I will only mention that from *Pizon's* more recent, minute investigations, for instance, it would appear that in the larval development, these organs are formed from the endoderm.

It will also be superfluous to our subject to describe how the organs thus commenced now develop to form the fully-developed Ascidian larva such as I have represented it here (Pl. X, fig. 6; Pl. XII, fig. 9).

It is generally known that during metamorphosis, the larva becomes attached, and undergoes radical changes. It will be remembered that first of all the central organs of the nervous system are completely changed, the larval cerebral vesicle being constricted, and the permanent ganglion coming into activity; that the tail with its chorda is partly cast, partly absorbed; and that the sucking-discs, etc. disappear.

The young Ascidian presents therefore an appearance such as is figured on Pl. X, fig. 9. Here, as in the larva (Pl. X, fig. 6), may be observed the branchial and atrial orifices, the endostyle, the branchial stigmata, and, in fig. 9, the *cellulose tunic*, which has already attained a certain importance. The formation of this organ I prefer to treat of in the next chapter.



## Kapitel 2.

### Knopankægget hos de forskellige grupper.

De forskellige familier af sammensatte Ascidier afviger i væsentlige anatomiske karakterer fra hinanden. Dette forhold har i den systematiske zoologi ført forfatterne til den opfatning, at hver større gruppe fylogenetisk har udviklet sig paa en forskellig maade fra den fælles stamform, saa at enkelte familier endog viser større anatomisk overensstemmelse med de enkle (ikke knopskydende) Ascidier end indbyrdes. *Herdman* siger saaledes: „The Ascidiae Compositae or Synascidiæ are polyphyletic, having been derived from the Simple Ascidians or their ancestors at three distinct points. The result of this is that the Compound Ascidians form three groups (1) the *Polystyelidae*, (2) the *Botryllidae* and (3) the remainder, which are more nearly related to particular groups of Simple Ascidians than they are to one another“. „Pyrosoma, although now a pelagic free-swimming organism, was derived from the fixed Compound Ascidians“. (24).

I nedenforstaaende fig. har *Herdman* gjengivet sin opfatning af de enkelte gruppers slægtskabsforhold. Familierne *Perophora* og *Clavelina* antages at være primitive former, der er vidt forskellige fra de andre familier. *Polycliniderne* danner en begrændset gruppe, de staar nærmest *Didemniderne*. *Botrylliderne* er maaske den bedst begrændsede gruppe, og de synes at staa de enkle Ascidier som *Ciona*, *Ascidia* nærmere end *Polycliniderne*.



Fig. 6.

Efter *Herdman* (24, pag. 150).

Ogsaa knopskydningen viser derfor hos de forskellige familier store forskelligheder. Hos *Clavelina* og *Perophora* udvikler knopperne sig fra de lange cylinderformige stoloner, hos *Polycliniderne* dannes de fra postabdomen, hos *Distaplia* ved en udbugtning af tarmen, hos *Botrylliderne*

## Chapter II.

### The Bud-rudiment in the Various Groups.

The various families of Compound Ascidians differ from one another in essential anatomical characters. This circumstance has led writers on systematic zoology to the opinion that each large group has developed phylogenetically in a different way from the common primitive form, so that certain families even show greater anatomical harmony with the Simple (non-bud-producing) Ascidians, than with their own group. Thus *Herdman* says: „The Ascidiae Compositae, or Synascidiæ, are polyphyletic, having been derived from the Simple Ascidians, or their ancestors, at three distinct points. The result of this is that the Compound Ascidians form three groups, (1) the *Polystyelidae*, (2) the *Botryllidae* and (3) the remainder, which are more nearly related to particular groups of Simple Ascidians than they are to one another“. „Pyrosoma, although now a pelagic, free-swimming organism, was derived from the fixed Compound Ascidians.“ (24).

In the figure below, *Herdman* has reproduced his idea of the relationship of the different groups. The families *Perophora* and *Clavelina* are assumed to be primitive forms that differ widely from the other families. The *Polyclinidae* form a limited group, standing nearest to *Didemnidae*. The *Botryllidae* are perhaps the best defined group, and they seem to stand nearer to such Simple Ascidians as *Ciona* and *Ascidia*, than to the *Polyclinidae*.



ved en udbugtning af peribranchialsækken. Der er altsaa hos de forskellige familier forskellige organer, hvorfra knopdannelsen kan udgaa. Dette har allerede for længere tid siden ført *Giard* til at opstille 3 knopskydningsmodi, nemlig en (19):

*Blastogénèse palléale* (Botryllidæ).

*Blastogénèse stoloniale* (Clavelina, Perophora, Polyclinidæ).

*Blastogénèse pylorique* (Distaplia).

Ser man foreløbig bort fra denne forskellighed i dannelsen, anlægget af knopperne hos de forskellige familier, og studerer man grundigere knopanlæggets formforhold, anatomi, da viser denne hos alle grupper saa store overensstemmelser, at knopskydninger overalt paa det tydeligste viser sig at være en og den samme udviklingsmodus. Hos alle grupper bestaar nemlig det unge knopanlæg af to concentriske, blæreformede epithelmembraner, af hvilke altsaa den ene (den „ydre“) omgiver den anden (den „indre“), og mellem hvilke der desuden vandrer mesodermale elementer ind fra moderdyret.

Medens nu knopanlæggets ydre blære overalt dannes af moderdyrets hud, epidermis, saa frembyder den indre blæres dannelse den eiendommelighed, at den hos forskellige familier anlægges ud fra forskellige organer. Efter den foreliggende Ascidielitteratur har det da vist sig, at den indre blære hos knopperne af

<i>Distaplia</i> ,*)			
<i>Pyrosoma</i> samt			
Abdominalknoppen hos <i>Didemniderne</i>		dannes fra	
hos		Tarmtraktus.	
<i>Amaroucium</i>	fra postabdomens		
<i>Polyclinum</i> o s.v.	skillelæg.		
hos			
<i>Perophora</i>	fra stolonernes	altsaa fra epi-	
<i>Clavelina</i>	skillelæg.	cardiet.	
hos			
Thoracalknoppen			
hos <i>Didemniderne</i>	fra epicardiet.		
hos			
<i>Botrylliderne</i>		fra peribranchial-	
<i>Polystyeliderne</i>		sækken.	

Skjønt altsaa, som ovenfor nævnt, knopanlæggets indre blære overalt viser den samme bygning og overalt spiller den samme rolle for knoppens organdannelse, saa finder det eiendommelige forhold sted, at blæren hos en gruppe kan anlægges fra tarmtraktus, hos en anden fra epicardiet, hos en tredje fra peribranchialsækken.

Dette — nu almindelig anerkjendte faktum har frembudt store theoretiske vanskeligheder for alle dem, der har studeret Ascidierne knopskydning. Man har havt den faste formening, at alle dannelser, der viser samme bygning og funktion ogsaa maa anlægges paa samme maade og ud fra samme „materiale“. Det har da især vakt tvivl, at to saa forskelligartede organer som tarmtraktus og peribranchial-

an evagination of the peribranchial cavity. There are thus in the various families, various organs from which the bud may originate. This led *Giard* (19), some time ago, to establish 3 ways of budding, viz:

*Blastogénèse palléale* (Botryllidæ),

*Blastogénèse stoloniale* (Clavelina, Perophora, Polyclinidæ),

*Blastogénèse pylorique* (Distaplia).

If, independently of this difference in the formation of the rudiment of the bud in the various families, we study more carefully the conditions of form, the anatomy, of the incipient bud, it presents in all the groups such great harmony, that budding is everywhere most distinctly proved to be one, and one only, mode of development; for in every group, the young incipient bud consists of two concentric, vesicular, epithelial membranes, one of which (the „outer“) surrounds the other (the „inner“), and between which, mesoderm elements from the parent animal also find their way.

Now while the outer vesicle of the incipient bud is always formed from the epidermis, of the parent animal, the peculiarity of the formation of the inner vesicle is, that in different families it is developed from different organs. According to the Ascidian literature now before us, it appears that the inner vesicle in buds of

<i>Distaplia</i> ,*) and			
<i>Pyrosoma</i> , and			
Abdominal buds in <i>Didemnidae</i>		are formed from	
in		the alimentary	
<i>Amaroucium</i>	from the septum of		
<i>Polyclinum</i> , etc.	the post-abdomen;		
in			
<i>Perophora</i> and	from the septum of	therefore from	
<i>Clavelina</i>	the stolons;	the epicardium;	
in			
Thoracic buds in	from the epicar-		
<i>Didemnidae</i>	dium;		
and in			
<i>Botryllidae</i> and		from the peribranchial	
<i>Polystyelidae</i>		cavity.	

Thus although, as mentioned above, the inner vesicle of the rudimentary bud always exhibits the same structure, and always plays the same part in the formation of the organs of the bud, the peculiar fact remains, that in one group it may originate in the *alimentary canal*, in another in the *epicardium*, in a third in the *peribranchial cavity*.

This now generally-acknowledged fact has presented great theoretical difficulties to all who have studied the budding of Ascidiae. The opinion, that all formations exhibiting the same structure and function must also originate in the same way, and from the same „material“, has been firmly held. Doubt has especially been aroused by the fact that two such heterogeneous organs as the alimentary

\*) Under korrektoren er Julin's „Recherches sur la Blastogenèse chez *Distaplia*“. Compt. Rend. des Séances du 3 congr. intern. zool. 1895 kommen mig ihænde. Ifølge dette interessante arbejde kommer knopperne hos *Distaplia* fra et epicardium.

\*) While this paper was in the press, I fell in with Julin's „Recherches sur la Blastogénèse chez *Eistaplia*“, compt. Rend. des Séances du 3<sup>e</sup> congr. intern. zool. 1895. According to this interesting work, the buds in *Distaplia* come from an epicardium.

sæk kunde frembringe den samme dannelse, og disse tvivl bestyrkedes end mere derved, at de embryologiske undersøgelser med overveiende samstemmighed beskrev peribranchialsækken som en ektodermal dannelse. Problemet tilspidsede sig derefter mere og mere i det spørgsmaal: „Kan ektodermen og entodermen saaledes give anledning til anlægget af den samme formdannelse?“ Ved nærmere betragtning fandt man det fremdeles uantageligt, at *Botryllusknoppen* kunne udvikles ud fra to ektodermale blærer, altsaa uden „entodermalt materiale“.

*Pizon* har gjort et særdeles interessant forsøg paa at finde overensstemmelser mellem alle knopkydninger med hensyn til det „kimbladmateriale“, hvorfra de dannes. Hans undersøgelser førte ham, som jeg nævnte i Kap. I, til den opfatning, at peribranchialsækken hos *Botryllidernes* larver ikke dannes som to ektodermaludbugtninger, men som to udbugtninger af entodermen, der siden forenede sig til en fælles peribranchialsæk. Fra denne dannede der sig nu senere to udbugtninger, der omklæder tarmen, og disse kaldte han *epicardialudbugtninger*. Da nu knopperne hos *Botrylliderne* i regelen opstaar i moderdyrets bagre kropsparti, saa mente han, at knopkydningen ogsaa hos *Botrylliderne* udgik fra entodermen og det endog fra epicardialdannelserne. Da nu fremdeles epicardialdannelserne dels direkte (*Amaroucium*, *Clavelina*) dels indirekte (*Botryllus*) var entodermdannelse saa fandtes der ingen forskjel med hensyn til knopanklægget hos de forskellige sammensatte Ascidier. Overalt dannedes knopanklægget af en indre entodermal og en ydre ektodermal blære, ligesom gastrulastadiet i embryonaludviklingen bestod af to blærer, den ydre ektodermen, den indre entodermen.

Det er indlysende, at denne opfatning staar og falder med de udviklingshistoriske undersøgelser over *embryonaludviklingen*. Vi saa da i kap. I, at den embryologiske litteratur med afgjorende samstemmighed førte til det resultat, at peribranchialsækken iallefald hos de fleste Ascidiefamilier var en ren ektodermaldannelse (jeg minder om *Kowalevskys*, *Seeligers*, *Willeys*, *Caullerys* og egne undersøgelser). Jeg drog heraf den slutning, at man enten indsætning til *Pizon* maatte antage at peribranchialsækken ogsaa hos *Botrylliderne* var en ektodermaldannelse, eller at vi stod over for det — theoretisk vigtige — forhold, at peribranchialsækken hos den ene larve dannede sig fra ektodermen, hos den anden fra entodermen. Jeg gjorde fremdeles opmærksom paa, at man under enhver omstændighed ligegyldig hvorledes peribranchialsækken dannedes, dog ikke kunde kalde endel af dette organ for *epicardium*, idet dets specielle funktion og bygning var altfor forskjellig fra de typiske epicardialdannelser hos f. eks. *Amaroucium*.

Det er selvfølgelig tvivlsomt, hvorvidt man har berettigelse til at benegte rigtigheden af en videnskabelig undersøgelse udført af en dygtig forsker som *Pizon*, hvor man selv ikke har egne erfaringer fra samme objekt, og ønsker jeg mindst af alle af ensidige theoretiske synspunkter at fores til et falsk resultat. Jeg tillader mig imidlertid at

canal and the peribranchial cavity could produce the same formation, and this doubt was strengthened yet more by the great unanimity with which embryological investigations described the peribranchial cavity as an ectodermal formation. The problem then resolved itself more and more into the question: Can the ectoderm and the endoderm give rise to the same form-formation? On further consideration it was still deemed inadmissible, that the *Botryllus bud* could be developed from two ectodermal vesicles, or, in other words, without „endodermal material“.

*Pizon* has made an especially interesting attempt to find harmony between all kinds of budding, as regards the germ-layer material of which they are formed. His investigations led him, as I stated in Chapter I, to the opinion that the peribranchial cavity in *Botryllidæ* larvæ is not formed in the shape of two ectodermal invaginations, but in the shape of two evaginations of the endoderm, which afterwards unite to form a common peribranchial cavity. From this are subsequently formed two evaginations, which encase the intestine, and these he called *epicardial evaginations*. Now, as the buds in *Botryllidæ* originate, as a rule, in the posterior part of the parent-animal's body, *Pizon* considered that budding, in *Botryllidæ* too, originated in the endoderm, and even in epicardiac formations. As epicardiac formations, some direct (*Amaroucium*, *Clavelina*) some indirect (*Botryllus*), were still endodermal formations, there was no difference, as regards the origin of the bud, in the various Compound Ascidians. The incipient bud was always formed from an inner endodermal, and an outer ectodermal vesicle, just as the gastrula stage in the embryonic development consisted of two vesicles, the outer, the ectoderm, the inner, the endoderm.

It is obvious that this theory is dependent upon the developmental-historical investigations in *embryonic development*. We saw in Chapter I, that embryological literature, with decisive unanimity, pointed to the conclusion that the peribranchial cavity, at any rate in most Ascidian families, was purely an ectodermal formation. (I would call to mind *Kowalevsky's*, *Seeliger's*, *Willey's*, *Caullery's* and my own investigations). From this I drew the conclusion that either, in opposition to *Pizon*, we must presume that the peribranchial cavity in *Botryllidæ* too, is an ectodermal formation, or that we were facing the theoretically important circumstance, that in the one larva, the peribranchial cavity was formed from the ectoderm, in the other from the endoderm. I still called attention to the fact, that under any circumstance, no matter how the peribranchial cavity was formed, a part of that organ could not be called the *epicardium*, as its special function and structure differed too much from the typical epicardiac formations in, e. g., *Amaroucium*.

It is of course doubtful how far one is justified in denying the correctness of a scientific investigation made by an able naturalist like *Pizon*, when one has no personal experience of the same subject; least of all would I wish to be led, by one-sided theoretical points of view, to a wrong conclusion. I venture, however, to propose the



opkaste det spørgsmål til fornyet og grundigere overvejelse: „Hvad er mest uoverensstemmende med den almindelige embryologiske erfaring og med den saakaldte kimbladlære, enten den antagelse, at *peribranchialsækken* hos forskellige familier anlægges fra forskellige kimblade i embryonaludviklingen, eller den opfatning, at begge kimblade endog sent i udviklingens forløb formaa i lige grad ved knopskydning at danne nye individer?“

Som det nærmere vil blive gjenstand for betragtning i dette arbeides generelle del, er kimbladlæren fremforalt en generalisering af den almindelige embryologiske erfaring, at bestemte organer, som f. eks. centralnervesystemet, i embryonaludviklingen kommer til anlæg og udvikling paa den samme maade og fra det samme primære kimblad overalt i dyreriget. Fra denne regel forekommer der vistnok mindre undtagelser, der viser, at udviklingen heri besidder en vis modificerbarhed, men en saa stor afvigelse fra regelen som den, at et organ hos en familie dannes fra *ektodermen*, og hos en anden familie af samme gruppe fra *entodermen*, er dog ganske ukendt. Skulde dette dog vise sig at være tilfældet, hvad man maaske ikke tør benægte paa forhaand, saa vil det være et nyt og vigtigt bidrag til forstaaelsen af, *inden hvilke grændser* embryonaludviklingen er bunden til en bestemt lovmæssighed. Under enhver omstændighed maa imidlertid ikke et saadant forhold anføres for at vise at der i *Ascidieudviklingen* ikke forekommer afvigelser fra kimbladlæren.

Betragter vi nu knopanlægget og knopskydningen, saa forekommer det mig under enhver omstændighed, selv om *peribranchialsækken* hos *Botryllus*larven er et entodermalt organ, at man ikke hos nogen gruppe kan kalde knopanlæggets indre blære et entodermalt anlæg. Dels viser nemlig den videre knopudvikling (se Kap. 3), at denne indre blære danner de mest forskellige organer, og dels er dog knopanlægget, saasnt det eksisterer som saadant, *et nyt individ*. Ligesaa lidt som man derfor hos hvirveldyrene kalder centralnervesystemet et mesodermalt organ, skjønt det dannes af ægget, der engang var en mesodermal celle, saa maa man ogsaa for knoppernes vedkommende undlade at „projicere“ dem tilbage paa moderdyrets organer. Knoppens forskellige dele faar betragtes i forhold til den hele knops egen bygning. Det viser sig da, som vi siden skal se, at knoppen aldeles ikke har kimblade; hvis den har det, saa er de (de to blærer) andre slags kimblade end hos larven, og knopudviklingen har derfor intet med kimbladlæren at gøre. Kimbladlæren er dannet for larveudviklingen og lærer, hvorledes larven opbygges af det befrugtede æg. Kun paa et punkt berører kimbladlæren læren om knopperne. Materialet til knopperne kommer fra larvens kimblade, ikke i form af kimblade men i form af enkle epithelmembraner. Dette forhold lærer os altsaa ikke noget om den egentlige embryonaludvikling og dens forløb, men det viser os kun, at der i kimbladene, *ektodermen* som *entodermen* under udviklingen findes materiale, der *naar det kommer under andre og nye forhold, naar det*

following question for renewed and more thorough consideration: Which is the more at variance with general embryological experience, and with the so-called germ-layer theory, the supposition that the *peribranchial cavity*, in different families, originates in different germ-layers in the embryonic development; or the theory that both germ-layers, even if late in the course of development, are equally capable of forming new individuals by budding?

The germ-layer theory, as will be shown in the further consideration of the subject in the General Section of this paper, is above all a generalisation of the ordinary embryological experience that certain organs, as, for instance, the central organs of the nervous system, in the embryonic development, originate and develop in the same manner, and from the same primary germ-layer, throughout the animal kingdom. It is true, there are some small exceptions to this rule, which show that the development herein possesses a certain capability of modification, but so great a departure from the rule, as that an organ in one family is formed from the ectoderm, and in another family of the same group, from the endoderm, is quite unheard-of. Should this, however, prove to be the case, and perhaps one cannot venture to deny it at the outset, it will be a new and important contribution to the comprehension of the question as to *within what limits* embryonic development is bound to a fixed conformity to law. In any case, however, such a circumstance must not be brought forward to show that in *Ascidian* development there are no deviations from the germ-layer theory.

If we consider the commencement and progress of the bud, it seems to me that under any circumstance, even if the peribranchial cavity in the *Botryllus* larva is an endodermal organ, in no group can we call the inner vesicle of the incipient bud an endodermal rudiment. The further development of the bud partly shows (see chap. III) that this inner vesicle forms the most various organs, and yet, to a certain extent, the rudimentary bud, as soon as it comes into existence as such, is *a new animal*. We are no more entitled to „project“ the origin of the buds back to the organs of the parent animal, than we are, in the case of vertebrate animals, to call the cerebro-spinal tube a mesodermal organ, although it is formed from the ovum, which was once a mesoderm cell. The various parts of the bud must be considered in relation to the particular structure of the whole bud. It then appears, as we shall subsequently see, that the bud has no germ-layers at all; if it has, then they (the two vesicles) are a different kind of germ-layer to that of the larva, and the development of the bud has therefore nothing to do with the germ-layer theory. The germ-layer theory is formed for larval development, and teaches how the larva is formed from the impregnated ovum. Only on one point has the germ-layer theory any connection with that of buds. The material for the buds comes from the germ-layers of the larva, not in the form of germ-layers, but in that of simple epithelial membranes. This circumstance, therefore, does not teach us anything about the actual embryonic develop-



erholder en anden udviklingsretning formaar at danne et nyt individ.

Er peribranchialsækken hos *Botrylliderne* et ektodermalt organ, saa kan saadant materiale findes hos begge kimblade, ja et kimblad (ektodermen) kan da alene danne et nyt individ, som jeg allerede i tidligere arbejder udtrykkelig har fremhævet. Et saadant forhold berører kun den *udviklingsmekaniske opfatning* af kimbladene (se Kap. 5); det udsiger intet om den egentlige og vigtigste kimbladlære, at embryonaludviklingen overalt i dyreriget eller inden større grupper følger de samme love i sine form- og organdannelser.

Efter min opfatning er derfor de støttepunkter, som *Pizon* har anført for sin knopskydningstheori endnu vanskeligere at bringe i overensstemmelse med kimbladlæren, end den antagelse, at kimbladene kan indeholde udifferentieret materiale, der indeholder kræfter og materiale til nydannelser; og finder jeg endnu at kunne opretholde den opfatning af det hele knopanlæg, som jeg i et tidligere arbejde (31) har udtrykt saaledes: „Hos alle grupper dannes der en tobladet blære og overalt danner den indre af de to blade de samme organer, nemlig tarm, peribranchialsæk og nervesystem. Men, som jeg har vist ovenfor, kommer den indre blære hos *Perophora*, *Didemnum*, *Clavelina* fra endodermen, hos *Botryllus* fra den ektodermale, larvale peribranchialsæk. Alene det faktum, at den samme indre blære, som alene dannes af et af larvens kimblade, kan danne saa forskellige organer som tarm og nervesystem, synes tilfulde at vise, at dette kimblad ikke maa opfattes saaledes som det almindelig sker. Cellerne har meget mere en endnu indifferent karakter, saadan som embryonaludviklingens blastulastadium har det; og dette indifferente cellemateriale gaar over fra den ene generation til den anden“ (pag. 613).

Med dette forhold for øie vil vi mere indgaaende betragte knopanlæggets form og bygning hos de forskellige grupper.

Paa Pl. IX til Pl. XI har jeg søgt at illustrere knopanlægget og knopskydningens forløb hos grupperne *Perophora*, *Botryllus*, *Distaplia*, *Amaroucium* (*Polyclinum*), *Pyrosoma*.

Pl. IX, fig. 1 gengiver efter *Kowalevsky* knopanlægget hos *Perophora*. Man ser her afbildet en gren af de bekjendte stoloner, der bestaar af to cylindriske udbugtninger, den ene omhyllende den anden. Den ydre er en fortsættelse af moderdyrets *epidermis* og den har et tykt lag cellulose hængende fast sammen med sine celler. Den indre er en fortsættelse af moderdyrets *epicardium*. Den danner skillevæggen i stolonen og *Kowalevsky's* tværsnit har vist hvorledes denne skillevæg er en fra den ene side til den anden afplattet dobbeltlamelle, som man maa tænke

ment and its course, but it shows us only, that in the germ-layers, — ectoderm as well as endoderm, — there is found, during development, material which *when brought into other and new conditions, where its development has taken another direction, is capable of producing a new individual*.

If the peribranchial cavity in *Botryllidæ* is an ectodermal organ, such material can be found in both germ-layers, indeed, one germ-layer (the ectoderm) can then alone form a new individual, a fact upon which I have already, in previous papers, laid particular emphasis. Such a circumstance affects only the *developmental-mechanical view* of the germ-layers (see Chap. V); it asserts nothing concerning the actual and most important germ-layer theory, that the embryonic development throughout the animal kingdom or within large groups, follows the same laws in the development of its form and organs.

In my opinion, therefore, the points which *Pizon* has quoted in support of his budding theory, are yet more difficult to bring into harmony with the germ-layer theory, than is the assumption that the germ-layers may contain undifferentiated material with power and material for new formations; and I still feel justified in maintaining the theory of the whole bud-development, which I have expressed as follows in a former paper (31): „In every group a bi-laminar vesicle is formed, and the inner of the two layers always forms the same organs, namely, the intestine, the peribranchial cavity and the nervous system. But, as I have shown above, the inner vesicle in *Perophora*, *Didemnum* and *Clavelina* comes from the endoderm, in *Botryllus*, from the ectodermal, larval peribranchial cavity. The very fact that the same inner vesicle, which is only formed from one of the germ-layers of the larva, can form such different organs as the intestine and the nervous system, seems to show clearly that this germ-layer must not be regarded in the ordinary way. The cells have, as yet, a much more indifferent character, such as in the blastula stage of the embryonic development; and this indifferent cell-material passes on from one generation to another (p. 613).

With this circumstance in view, we will consider more carefully the form and structure of the bud-rudiment in the various groups.

On Pl. IX, Pl. X and Pl. XI, I have endeavoured to illustrate the bud-rudiment and the course of budding in the groups *Perophora*, *Botryllus*, *Distaplia*, *Amaroucium*, (*Polyclinum*) and *Pyrosoma*.

Pl. IX, fig. 1 reproduces, after *Kowalevsky*, the rudimentary bud in *Perophora*. A branch of the well-known stolons is here represented, consisting of two cylindrical evaginations, the one enveloping the other. The outer one is a continuation of the parent-animal's *epidermis* and has a thick layer of cellulose firmly attached to its cells. The inner evagination is a continuation of the *epicardium* of the parent animal. It forms the septum in the stolon, and *Kowalevsky's* transverse section has shown how this septum is a double lamella flattened from side to side, and which

sig dannet ved afplatning af det oprindelige cylinderformige epicardium. Knopanlægget dannes, som figuren viser, derved at den ene lamelle bugtes ud og skyver den ydre cylinder, epidermis, foran sig, hvorved saavel epidermis som skillevæggens udbugtning snart antager den for knopanlægget karakteristiske blæreform.

Knopanlægget hos *Botrylliderne* illustreres af fig. 5 (Pl. IX). Man iagttager her, hvorledes paa dyrets venstre og høire sider peribranchialsækken danner lignende udbugtninger, der paa det i fig. 5 afbildede stadium allerede tydelig har antaget formen af blærer, og som snart næsten helt afsnøres fra moderdyret.

Den i fig. 9, pl. XII, afbildede larve af *Distaplia* viser knopdannelsen hos denne familie. Det er her tarmpartiet nær æsophagus der ved udbugtning danner den „indre blære“. I cellulosekappen finder man desuden beliggende to allerede afsnørede knopper (*kn*). Af *Della Valles* og *Salenskys* undersøgelser (13, 55) er det bekjendt, at disse knopper formaar at formere sig ved deling.

Ogsaa hos *Pyrosoma* dannes den indre blære, her „stolonen“, hos knopperne (her tales ikke om de fire første men kun om de senere Ascidiozooider. Se foregaaende afhandling) af entodermen. Efter *Seeliger* (59) er pl. X, fig. 1 afbildet et moderindiv. med en yngre og en ældre knop, og man iagttager, at „stolonens“ indre streng, cylinder fortsætter sig i moderdyrets tarmtraktus.

Det er almindelig kjendt, at hos gruppen *Polychinidæ* foregaar knopdannelsen derved, at postabdomen deles i flere 4—5 knopper. Efter *Kowalevskys* grundlæggende undersøgelser har jeg afbildet dette pl. X fig. 7 og 8. Den indre blære fremgaar her direkte ved en afsnøring af epicardiet postabdomens skillevæg paa tvers. Se forøvrig *Huitfeldt-Kaas's* afhandling, dette verk pl. I, fig. 7, hvor det samme ogsaa er fundet for den af mig specielt undersøgte *Glossophorum sabulosum*.

Disse grupper skal nu tjene som de vigtigste repræsentanter for de forskjellige former af Ascidiernes knop-skydning.

Knopanlægget er, som nævnt, overalt bygget af 2 concentriske epithelblærer, der udbugtes eller afsnøres fra moderdyret; mellem disse blærer vandrer talrige mesoderm — respektive generationsceller ind i knopanlægget. Blærerne har, hvor en udbugtning finder sted, først halvkugle-saa kugleform; denne bliver imidlertid overalt snart aflang, hvorved dyrets senere længdeakse snart markeres.

Den ydre blære, der som vi saa altid var en fortsættelse af moderdyrets hud, epidermis, har overalt ogsaa epidermis histologiske bygning, og knop-skydningen finder intet-

must be imagined as formed by the flattening of the originally cylindrical epicardium. The rudimentary bud is formed, as the figure shows, by one lamella bulging out, and pushing the outer cylinder — the epidermis — before it, thus causing the evaginations both of the epidermis and the septum soon to assume the vesicular form characteristic of the incipient bud.

The rudimentary bud in *Botryllidæ* is illustrated in fig. 5, Pl. IX. It will here be seen how, on the right and left sides of the animal, the peribranchial cavity forms similar evaginations, which, in the stage represented in fig. 5, have already distinctly assumed the form of vesicles, and which are soon almost entirely cut off from the parent animal.

The larva of *Distaplia*, represented in fig. 9, Pl. XII, shows the formation of the bud in that family. Here, it is that part of the intestine near the æsophagus, which, by evagination, forms the „inner vesicle“. In the cellulose tunic, there are also two already constricted buds (*kn*). It is well known from *Della Valle's* and *Salensky's* investigations (13, 55) that these buds are capable of propagation by fission.

In *Pyrosoma* too, the inner vesicle — here the „stolon“ — is formed in the buds (the first four buds are not meant here, but only the later Ascidiozoooids: see the preceding paper) from the endoderm. On Pl. X, fig. 1 is represented, after *Seeliger* (59) a parent animal with one young, and one older bud; and it will be observed that the inner cord, or cylinder of the stolon is continued into the intestine of the parent animal.

It is generally known that in the group *Polychinidæ*, budding takes place by the division of the postabdomen into several — 4 or 5 — buds. I have drawn figs. 7 and 8, Pl. X, from *Kowalevsky's* fundamental investigations. The inner vesicle here proceeds directly from a transverse constriction of the epicardium (the wall of the postabdomen). See also *Huitfeldt-Kaas's* paper in the present work, Pl. I, fig. 7, where the same thing was found in a *Glossophorum sabulosum*, specially examined by me.

These groups are now to serve as the most important representatives of the different forms of budding in the Ascidiæ.

The incipient bud, as already mentioned, is always constructed of 2 concentric epithelial vesicles, which are evaginated or constricted from the parent animal; between these vesicles, numerous mesoderm — as well as generative cells find their way into the incipient bud. Where an evagination takes place, the vesicles have first a hemispherical, and then a spherical shape, which always, however, soon becomes oblong, whereby the subsequent long axis of the animal is marked.

The outer vesicle, which, as we have seen, is always a continuation of the skin — epidermis — of the parent animal, has also always the histological structure of the



steds sted, førend denne har antaget sin karakteristiske struktur. Til forstaaelse af den „ydre blære“ hos knopperne maa vi derfor betragte den almindelige opfatning af Ascidiernes epidermis. Jeg tillader mig at gengive *Heiders* udmerkede fremstilling af dette punkt (pag. 1284): „Die Ectodermzellen, welche ursprünglich mehr cubische Gestalt hatten, später jedoch eine flachere Form annehmen, scheiden zur Zeit der Entwicklung des Schwanz-Abschnittes an ihrer äusseren Oberfläche eine homogene, cuticulare Schicht ab, welche von ihrem ersten Auftreten an die Cellulosereaktion zeigt. Es ist die erste Anlage des Cellulose-Mantels der Ascidie“. „Während der Mantel bei *Doliolum* und den Appendicularien zeitlebens eine derartige einfache homogene Cuticularschicht bleibt, verdickt er sich bei den Ascidien (sowie bei den Pyrosomen und Salpen) beträchtlich und es wandern einzelne Zellen in die Celluloseschicht ein. Während man bisher im Anschluss an O. Hertwig glaubte, dass diese in die Cellulose-Substanz einwandernden Zellen dem Ectoderm entstammen, hat neuerdings Kowalevsky den Nachweis erbracht, dass die Mantelzellen dem Mesoderm des Embryos angehören“. „Wir werden den Mantel der Tunicaten als eine von Phagocyten durchwanderte cuticulare Gallertabscheidung betrachten dürfen“. *Seeliger* (62) har endog kunnet betragte denne dannelsesmaade hos de levende væv.

epidermis, and budding never takes place until it has assumed its characteristic structure. In order, therefore, to comprehend the outer vesicle in the bud, we must consider the general view of the epidermis of Ascidians. I venture to reproduce *Heider's* excellent account of this point (p. 1284): „Die Ectodermzellen, welche ursprünglich mehr cubische Gestalt hatten, später jedoch eine flachere Form annehmen, scheiden zur Zeit der Entwicklung des Schwanz-Abschnittes an ihrer äusseren Oberfläche eine homogene, cuticulare Schicht ab, welche von ihrem ersten Auftreten an die Cellulosereaktion zeigt. Es ist die erste Anlage des Cellulose-Mantels der Ascidie“. „Während der Mantel bei *Doliolum* und den Appendicularien zeitlebens eine derartige einfache homogene Cuticularschicht bleibt, verdickt er sich bei den Ascidien (so wie bei den Pyrosomen und Salpen) beträchtlich und es wandern einzelne Zellen in die Celluloseschicht ein. Während man bisher im Anschluss an O. Hertwig glaubte dass diese in die Cellulose-Substanz einwandernden Zellen dem Ectoderm entstammen, hat neuerdings Kowalevsky den Nachweis erbracht, dass die Mantelzellen dem Mesoderm des Embryos angehören.“ „Wir werden den Mantel der Tunicaten als eine von Phagocyten durchwanderte cuticulare Gallertabscheidung betrachten dürfen“. *Seeliger* (62) has even been able to consider this mode of formation in the living tissues.

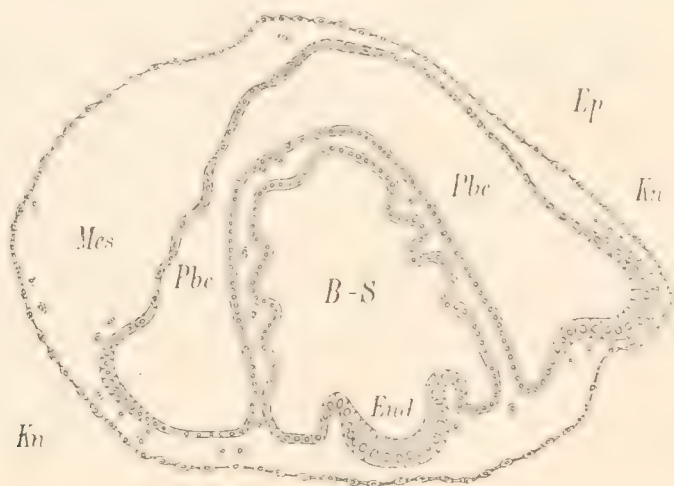


Fig. 7.

*Ekt* = Ektoderm, *End* = Endostyl, *B-S* = Branchialsæk, gjælletarm, *Pbc* = Peribranchialsæk, *Mes* = Mesodermceller, *Kn* = Anlægget til knoppens indre blære.

Ascidiernes „epidermis“ er saaledes at opfatte som et meget høit differentieret væv. Af dannelser i andre dyregrupper maa den utvivlsomt bedst sammenlignes med cuticularannelser, og det fremgaar heraf, at ogsaa knoppens „ydre blære“ fra første øieblik af er et ganske anderledes differentieret materiale end larvernes ektoderm. Fig. 9, Pl. X giver f. eks. et billede af kappens formforhold hos et ganske ungt individ af *Amarousium roseum*, der endnu paa langt nær ikke er istand til en knopskydning, idet postabdomen endnu ikke er dannet, og man vil heraf se, at knoppen fra første øieblik faar med i tilgift en tyk celluloseschicht. Som ogsaa *Seeliger* har fremhævet, har dette den vigtige følge for organdannelsen i knopperne, at den ydre

*Ekt* = ectoderm, *End* = endostyle, *B-S* = branchial sac, branchial gut, *Pbc* = peribranchial cavity, *Mes* = mesoderm cells, *Kn* = rudiment of the inner vesicle of the bud.

The „epidermis“ of Ascidians must thus be regarded as a very highly differentiated tissue. Of all formations in other groups of animals, it may undoubtedly best be compared with cuticular formations, and hence it is that also the „outer vesicle“ of the bud, from the very beginning, is a far more highly differentiated material than the ectoderm of the larva. Pl. X, fig. 9 gives, for instance, an illustration of the condition of form in a very young specimen of *Amarouchium roseum*, which is still far from capable of producing buds, the post-abdomen not yet being formed; and hence it will be seen that from the very beginning, the bud has, into the bargain, a thick cellulose layer. As *Seeliger* too has pointed out, this fact has, for



blære forholder sig som et passivt organ, der ikke kan udvikle nogen nydannelser.

I moderdyret viser derfor altid den første begyndelse til knopskydningen sig i det organ, der danner den indre blære.

Ovenstaaende figur viser saaledes, hvorledes de første antydninger til knopskydningen hos *Botrylliderne* begynder dermed, at enkelte af peribranchialsækkens flade epithelceller vokser i størrelse, de bliver først cubiske, senere cylindriske, og hele cellepartiet bugter sig nu halvkugleformig udad, hvorved epidermis skyves foran. Man vil da let forstaa, hvorledes efterhaanden det noget ældre stadium, fig. 5, Pl. IX, fremgaar af ovenstaaende figur.

En mere indgaaende forstaaelse af de forskellige deles betydning og morphologiske værdi i knopanlægget, kan imidlertid først forstaaes ved et studium af knoppens videre udvikling. At give en fremstilling af dennes forløb vil derfor være vor opgave i det følgende kapitel.

### Kapitel 3.

#### Organdannelsen hos knopperne.

Et studium af litteraturen over Ascidiernes knopskydning viser, at næsten hver forfatter har sin egen fremstilling. Specielt er opfatningerne over nervesystemets dannelse særdeles forskellige, og dette vanskeliggjør i høj grad forsøget paa at give en samlet fremstilling af den hele udviklingsproces. Af denne grund har jeg i mine tidligere arbejder kun med få ord anstillet sammenligninger, idet jeg efterhaanden søgte at skaffe mig materiale til selvstændige erfaringer fra de forskellige familier. Det har hidtil lykkedes mig at studere grupperne *Botryllus*, *Distaplia* og *Polyclinum* samt tildels *Perophora* og *Pyrosoma*. Resultaterne af disse sammenlignende undersøgelser har bestyrket mig i den tro, at knopskydningen overalt foregaar paa den samme maade og derfor overalt er den samme udviklingsproces. Før jeg imidlertid gaar over til at give en skildring af knopskydningen i sin almindelighed, vil jeg dels efter egne undersøgelser dels efter litteraturen gennemgaa de vigtigste grupper, og jeg begynder da med den form, som dannede udgangspunktet for *Kowalevskys* grundlæggende undersøgelser, nemlig *Perophora listeri*, Wiegman.

#### Perophora.

I Kap. 2 saa vi, at knopperne hos *Perophora* dannes fra de lange forgrenede stolonier. Under henvisning til Pl. IX, fig. 1 skildrede jeg, at knopanlæggets indre blære dannedes ved udbugtning af stolonens „skillevæg“ (moderdyrets epicardium), og idet denne udbugtning forårsagede en lignende udbugtning af stolonens epidermis dannedes knopanlægget i form af 2 blærer med vandrende mesodermceller imellem dem.

the formation of the organs in the bud, this important consequence, namely, that the outer vesicle remains as a passive organ, which cannot develop any new formation.

In the parent animal therefore, the earliest commencement of budding always appears in the organ which forms the inner vesicle.

The above figure shows how the first indication of budding in *Botryllidæ* is an increase in the size of a few of the flat epithelium cells of the peribranchial cavity, which become first cubical and then cylindrical, while the whole cellular part bulges out in a hemispherical shape, thereby pushing the epidermis in front. It will then be easily understood how by degrees the rather more advanced stage in fig. 6, Pl. IX, develops from the above figure.

A more thorough comprehension of the significance of the different parts and their morphological value in the rudimentary bud, can however, only be obtained by a study of the further development of the bud. It will therefore be our endeavour to give an account of its course in the next chapter.

### Chapter III.

#### The Formation of the Organs in the Bud.

A study of the literature on budding in Ascidians shows that nearly every author has his own theory. The theories on the formation of the nervous system in particular are exceedingly varied, and this greatly enhances the difficulty of an attempt to give a collected statement of the whole developmental process. For this reason, I have, in my previous papers, only drawn brief comparisons, endeavouring by degrees to obtain material for independent experience from the different families. Up to the present, I have succeeded in studying the groups *Botryllus*, *Distaplia*, *Polyclinum* and, to some extent, *Perophora* and *Pyrosoma*. The results of these comparative investigations have strengthened me in the belief that budding always takes place in the same manner, and is therefore always the same developmental process. Before I proceed, however, to give a description of budding in general, I will go through the most important groups, partly from my own investigations, partly from literature, beginning with the form which was the starting-point for *Kowalevsky's* fundamental investigations, viz. *Perophora listeri*, Wiegman.

#### Perophora.

In Chapter II, we saw that the buds in *Perophora*, were formed from the long, ramified stolonies. In directing attention to Pl. IX, fig. 1, I described how the inner vesicle of the incipient bud was formed by evagination of the wall of the stolon (epicardium of the parent animal); and as this evagination occasioned a similar evagination of the epidermis of the stolon, the incipient bud was formed in the shape of 2 vesicles, with wandering mesoderm-cells between them.

Udviklingen af dette anlæg til et nyt individ foregaar nu i det allervæsentligste ved forandringer i den „indre blære“ (*Kowalevsky's* „bourgeon interne“). „Presque tous les organes du *Perophora* se forment aux dépens du bourgeon interne: la paroi extérieure forme seulement le tégument du jeune individu“. (*Kowalevsky*) Figureerne 2, 3 og 4 fremstiller efter *Kowalevsky* (37) enkelte af hovedtrækkene af den indre blæres udvikling (pl. IX). Som figur 2 viser, undergaar den indre blære flere foldninger, der indleder dannelsen af de forskellige organer. To sagittale folder deler den indre blære helt i 3 blærer, en midtre (branchialsækken, tarmtraktus), og to laterale (anlæggene til peribranchialsækken). *Kowalevsky* afbilder ikke det stadium, da blærerne er helt adskilte, paa fig. 2 ser vi, at denne proces begynder og han beskriver dens videre forløb i teksten. Samtidig hermed vokser tarmen ud ved den indre blæres bagre ende som cylinderformigt rør, der ender blindt. Ogsaa de første anlæg til centralnervesystem og hjertet med dets epicardium viser sig allerede paa disse tidlige stadier.

Centralnervesystemet viser sig efter *Kowalevsky* først som fortykkelser paa den dorsale væg af den indre blære. „Aux stades suivants“, siger han, „ces épaississements se différencient considérablement et se présentent déjà sous la forme d'une tube étroit dont la partie supérieure, pour le moins, paraît déjà complètement fermée“. Denne beskrivelse stemmer overens med den paa fig. 2 afbildede dorsale tubus, og med den dannelse, som vi hos andre grupper skal lære at kjende under navnet „dorsalrøret“. Nøiere studier over rørets omdannelse til nervesystem finder vi ikke; man erindre, at disse glimrende undersøgelser udførtes for den moderne snitteknik.

Anlægget til hjertet og pericardiet har *Kowalevsky* seet paa ganske unge stadier som en liden cellehob i knoppens bagre parti. „Les cellules de cette lame, par leur aspect extérieur, la grandeur des noyaux qu'elles renferment et la transparence de leur continu, présentent de grands rapports avec les cellules épithéliales de la vésicule et diffèrent considérablement des globules sanguins, qui entourent la vésicule et s'arrêtent çà et là dans leurs mouvements. Entre les cellules de cette lame“ (anlægget til hjertet og pericardiet) „et la paroi de la vésicule, on ne peut à ce stade distinguer la moindre lumière, et les deux membranes sont encore solidement réunies l'une à l'autre.“ Hjertet og epicardiet fremgaar efter *Kowalevsky's* mening altsaa fra den indre blære. I cellehoben dannes der snart et lumen, og hjertet danner sig, som andetsteds, ved en indbugtning i pericardiet. Se fig. 2.

Figureerne 3 og 4 illustrerer senere stadier (disse figurer er tildels rettede efter egne iagttagelser).

Paa det i figur 3 afbildede stadium, er de 2 anlæg til peribranchialsækken voksende sammen til dannelsen af det sadelformige organ; ved sammenvoksninger med gjælle-

The development of this rudiment to a new animal now takes place for the most part by changes in the inner vesicle (*Kowalevsky's* „bourgeon interne“). „Presque tous les organes du *Perophora* se forment aux dépens du bourgeon interne: la paroi extérieure forme seulement le tégument du jeune individu“. (*Kowalevsky*) Figs. 2, 3 and 4 represent after *Kowalevsky* (37) certain of the principal features of the development of the inner vesicle (Pl. IX). As fig. 2 shows, the inner vesicle undergoes several foldings, which preface the formation of the various organs. Two sagittal folds divide the inner vesicle into 3 complete vesicles, one median (branchial sac, alimentary canal), and two lateral (rudiments of the peribranchial cavity). *Kowalevsky* does not show the stage when the vesicles are completely separated; but we see, in fig. 2, the commencement of this process, and he describes its further course in the text. Simultaneously with this, the intestine grows out at the posterior end of the inner vesicle as a cylindrical tube, ending cæcally. The earliest rudiments of the central organs of the nervous system, and the heart with its pericardium also appear even at these early stages.

According to *Kowalevsky*, the central organs of the nervous system first appear as a thickening of the dorsal wall of the inner vesicle. „Aux stades suivants“, he says, „ces épaississements se différencient considérablement, et se présentent déjà sous la forme d'une tube étroite, dont la partie supérieure, pour le moins, paraît déjà complètement fermée“. This description agrees with the dorsal tube represented in fig. 2, and with the formation which, in other groups, we shall learn to know under the name of the „dorsal tube“. We find no more minute study of the conversion of the tube into the nervous system; and it must be remembered that these brilliant researches were made before the modern perfection in the methods of making sections was arrived at.

The rudiment of the heart and pericardium *Kowalevsky* has seen in quite early stages as a little accumulation of cells in the posterior part of the bud. „Les cellules de cette lame, par leur aspect extérieur, la grandeur des noyaux qu'elles renferment, et la transparence de leur continu, présentent de grands rapports avec les cellules épithéliales de la vésicule, et diffèrent considérablement des globules sanguins, qui entourent la vésicule et s'arrêtent çà et là dans leurs mouvements. Entre les cellules de cette lame“ (the rudiment of the heart and pericardium) „et la paroi de la vésicule, on ne peut à ce stade distinguer la moindre lumière, et les deux membranes sont encore solidement réunies l'une à l'autre“. Thus the heart and the epicardium also proceed, in *Kowalevsky's* opinion, from the inner vesicle. A lumen is soon formed in the cell-mass, and the heart is formed, as in other cases, by an evagination in the pericardium (see fig. 2).

Figs. 3 and 4 illustrate later stages (These figures are to some extent corrected from personal observations).

In the stage represented in figure 3, the 2 rudiments of the peribranchial cavity have grown together to form the saddle-shaped organ; moreover, by coalescence with



tarmen har endvidere de første gjællespalter dannet sig. Tarmen er vokset betydelig og er naaet hen til kloaken. Ingestionsaabningen er dannet ved sammenvoksning mellem gjælletarm og epidermis, egestionsaabningen ved sammenvoksning af kloak (peribranchialsækkens dorsale parti) og epidermis. Centralnervesystemet viser sig nu som et bagtil lukket, cylindrisk rør, der fortil munder ud i gjælletarmen. Paa fig. 3 hænger knoppen endnu tydelig sammen med stolonen; denne forbindelse bliver væsentlig mindre i fig. 4, der i det hele fremstiller de samme forhold som fig. 3, men paa et noget ældre stadium.

I den senere tid er knopskydningen hos *Perophora* behandlet i 2 nye arbejder. Ritter har i en foreløbig meddelelse (50) omtalt, at centralnervesystemet efter hans undersøgelser anlægges paa lignende maade, som af mig skildret for *Botryllus* vedkommende, og hvortil jeg skal komme tilbage under denne gruppe. Derimod mener Lefèvre, at dorsaltuben, det fælles anlæg for centralnervesystem og hypophysis anlægges fra vandrende mesodermceller (42). Han siger pag. 76: „In the anterior region of the bud a little to the left of the median dorsal line there is seen a slender elongated mass of cells loosely grouped together and lying against the outer surface of the inner vesicle“. Det var umuligt for Lefèvre at finde nogen sammenhæng mellem disse celler og den indre blære. Senere optræder der et lumen i cellegruppen, den ordner sig til et epithelium og afsnører gangliet, som af mig beskrevet for *Botryllus*-knopperne.

Vi opsætter diskussionen af disse divergerende opfatninger til sidst i dette kapitel, efterat ogsaa andre grupper er beskrevet.

Lefèvre mener ogsaa, at anlægget for pericardium og hjerte hos *Perophora* anlægges fra mesodermceller imodsetning til den ovenfor skildrede fremstilling hos Kowalevsky.

Saa vel Ritter som Lefèvre har dernæst fundet, at stolonens skillevæg ikke, som Kowalevsky skildrer det, forbliver i forbindelse med branchialsækken men med den venstre halvdel af peribranchialsækken hos den unge knop, saasandt den indre blære deler sig i 3 blærer. Begge forfattere anfører dernæst, at denne forbindelse hos knopanlægget med stolonernes skillevæg snart løses. Naar Ritter heraf drager den slutning, at dette beviser, at stolonernes skillevæg hos *Perophora* ikke er at opfatte som Ascidiernes epicardium, da kan jeg heri ikke erklære mig enig. Jeg maa her, som ved andre anledninger kræve, at undersøgelser over Ascidieorganernes homologi maa løses ved studium af larverne og ikke af knopperne, især ikke de ganske unge knopper. Som man siden skal se, dannes f. eks. efter min fremstilling hos *Botryllus*-knoppen dorsaltubet fra peribranchialsækken, hos *Distaplia*-knoppen dannes det derimod efter Bonneries og mine undersøgelser fra den midterste af de 3 blærer, hvori „den indre blære“ de-

the branchial-gut, the first branchial stigmata have been formed. The intestine has grown considerably, and reaches to the cloaca. The branchial aperture is formed by a coalescing of the branchial gut and the epidermis, the atrial aperture by the coalescing of the cloaca (the dorsal part of the peribranchial cavity) and the epidermis. The central organs of the nervous system now appear as a cylindrical tube, closed behind, and opening in front into the branchial sac. In fig. 3, the bud is still distinctly connected with the stolon; this connection has become considerably slighter in fig. 4, which, on the whole, represents the same conditions as fig. 3, but at a much later stage.

In more recent times, the subject of budding in *Perophora* has been treated of in 2 new works. Ritter, in a preliminary account (50) has stated that the central organs of the nervous system commence, according to his investigations, in a similar way to that described by me in the case of *Botryllus*, and to which I shall return under that group. Lefèvre, on the other hand, considers that the dorsal tube, the common rudiment of the central organs of the nervous system and the hypophysis, originates in wandering mesoderm cells (42). On p. 76, he says: „In the anterior region of the bud, a little to the left of the median dorsal line, there is seen a slender elongated mass of cells, loosely grouped together, and lying against the outer surface of the inner vesicle“. It was impossible for Lefèvre to find any communication between these cells and the inner vesicle. Subsequently a lumen appears in the group of cells; they arrange themselves into an epithelium, and constrict the ganglion, as described by me in the case of *Botryllus* buds.

We will put off the discussion of these divergent opinions until the conclusion of this chapter, when other groups have also been described.

Lefèvre thinks too, that the rudiment of the pericardium and heart in *Perophora* originates in the mesoderm cells, contrary to Kowalevsky's description given above.

Both Ritter and Lefèvre have then found that the septum of the stolons does not, as Kowalevsky described it, remain in connection with the branchial sac, but with the left half of the peribranchial cavity in the young bud; as soon as the inner vesicle divides into 3. Next, both authors state that in the rudimentary bud, this connection with the septum of the stolons is soon broken off. When Ritter draws hence the conclusion that this proves that the septum of the stolons in *Perophora* is not to be interpreted as the Ascidian's epicardium, I cannot declare myself of the same opinion. I would here, as on other occasions, urge that questions regarding the homology of the Ascidian organs, must be solved by the study of the larvæ, and not of the buds, especially not of quite young buds. As we shall presently see, the dorsal tube, for instance, according to my statement with regard to the *Botryllus* bud, is formed from the peribranchial cavity, whereas in the *Distaplia* bud, it is formed, according to Bonnerie's and my



les. Dorsalrøret er hos *Distaplia* derfor efter min mening alligevel helt ud homolog med dorsalrøret hos *Botryllus*.

En helt anden sag vilde det være, om det viste sig, at stolonernes skillevæg hos *larven* dannes fra peribranchialsækken.

### Botryllidæ.

*Kowalevskys* videre undersøgelser (38) gjaldt *Distaplia* og *Amaroucium*. Han beskrev for disse grupper knopskydningens forløb efter ganske det samme skema, som jeg ovenfor har fremstillet for *Perophora*, og vi vil komme tilbage hertil under disse grupper. De videre fremskridt paa Ascidieknopskydningens omraade skyldtes dernæst studiet af *Botrylliderne*, idet *Pizon* (48 a), *Oka* (45) og forfatteren (31) uafhængig af hinanden beskrev denne gruppes knopskydning og kolonidannelse.\*)

Knopperne anlægges hos *Botryllus* som nævnt i Kap. 2 fra Peribranchialsækken af, et forhold, som allerede *Metschnikoff* og *Della Valle* (13) tidligere havde konstateret. Fig. 5, Pl. IX ser man de unge knopanlæg som 2 concentriske blæreformige udbugtninger af epidermis og peribranchialsækken. Ogsaa her er, efter min fremstilling, det hovedsagelig karakteristiske træk for knoppens udvikling det, at den „ydre blære“, epidermis, ingen anden rolle spiller i udviklingen end, at den danner knoppens hud. Alle andre organer dannes derfor af den indre blære og af de vandrende mesodermelementer.

Paa den indre blære iagttager man ligesom hos *Perophora* knoppen snart 2 sagittale folder, der her dog kun optræder fortil og ventralt, saa at den indre blære efterhaanden deles i en midtre blære, der bagtil og dorsalt staar i forbindelse med de 2 laterale blærer (anlægget til peribranchialsækken). Se fig. 6 og 7 pl. IX. Et tværsnit gennem knoppens bagre parti giver os paa det i fig. 6 afbildede stadium hosstaaende figur

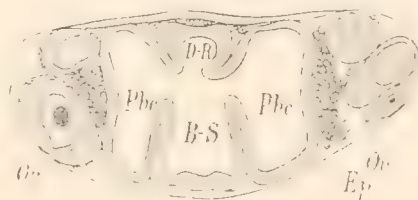


Fig. 8. Efter Hjort (31).

*Ep* = Epidermis, *B-s* = Branchialsæk, gjællertarm, *Pbc* = Anlægget til peribranchialsækken, *D-R* = dorsalrøret, *Ov* = Ovarier.

Den videre udvikling afviger deri fra knopskydningen hos *Perophora*, at peribranchialsækken ikke afsnøres som 2 sække, der siden igjen smelter sammen til et enkelt organ. Derimod snøres peribranchialsækken straks af som

investigations, from the middle of the 3 vesicles into which the inner vesicle is divided. The dorsal tube in *Distaplia* is therefore, in my opinion, entirely homologous with the dorsal tube in *Botryllus*.

I would be another matter altogether if it turned out that the septum of the stolons in the *larva* was formed from the peribranchial cavity.

### Botryllidæ.

*Kowalevsky's* further investigations (38) had reference to *Distaplia* and *Amaroucium*. He described the course of budding in these groups according to exactly the same plan as I have given above for *Perophora*, and we will return to it when discussing these groups. Further progress in the subject of Ascidian budding was due to the study of *Botryllidæ*, *Pizon* (48 a), *Oka* (45) and the present writer (31) having independently of one another described the budding and colony-formation of this group.\*)

The buds in *Botryllus* originate, as mentioned in Chapter II, in the peribranchial cavity, a fact which *Metschnikoff* and *Della Valle* (13) had already demonstrated. On Pl. IX, fig. 5, we see the young rudimentary bud as 2 concentric, vesicular evaginations of the epidermis and the peribranchial cavity. Here too, according to my interpretation, the most characteristic feature of the bud's development is that the outer vesicle, the epidermis, performs no other part in the development than that of forming the skin of the bud. All the other organs are therefore formed from the inner vesicle and the wandering mesoderm elements.

On the inner vesicle, just as in the *Perophora* bud, may soon be seen 2 sagittal folds, which here, however, only make their appearance anteriorly and ventrally, so that the inner vesicle is divided by degrees into a middle vesicle, which is connected posteriorly and dorsally with the 2 lateral vesicles (the rudiment of the peribranchial cavity). (See Pl. IX, figs. 6 and 7). A transverse section through the posterior part of the bud gives us the accompanying figure in the stage represented in fig. 6.

*Ep* = epidermis; *B-S* = branchial sac, branchial gut; *Pbc* = rudiment of the peribranchial cavity; *DR* = dorsal tube; *Ov* = ovaries.

The further development differs from budding in *Perophora* in that the peribranchial cavity is not constricted as 2 sacs which subsequently again coalesce into one organ. On the contrary, the peribranchial cavity is constricted im-

\*) *Pizon's* foreløbige meddelelse (46) var saavel *Oka*, som mig ubekjendt, hvad jeg for min del meget beklager.

\*) *Pizon's* preliminary account (46) was unknown both to *Oka* and myself, a circumstance which I, for my part, much regret.

en sadelformig dobbeltblære, der altsaa fra første øieblik omgiver gjællertarmen til begge sider og dorsalt. Se fig. 8, pl. IX. Fra peribranchialsækken vokser tidlig forover et blindt endende rør, hvis bagre munding sees paa hestaaende tekstfigur. Se forøvrig pl. IX, fig. 6. Dette rør, som det lykkedes mig at forfølge gennem alle stadier paa længde- og tværsnit, vokser dernæst sammen med gjællertarmen fortil og det danner saaledes en rørformig forbindelse mellem gjællertarmen og peribranchialsækken, fig. 7, pl. IX.

Under den videre udvikling snøres nu røret af fra peribranchialsækken, idet det lukker sig bagtil, og vi finder det da, som afbildet i fig. 8 (pl. IX) kun staaende i forbindelse med gjællertarmen fortil. I det følgende vil vi kalde dette rør „dorsalrøret“ for ikke at foregribe noget angaaende dets videre skjæbne og betydning.

Medens nu *Pizon* og *Oka* begge mener, at dorsalrøret alene danner hypophysis, fandt jeg, at gangliet afsnørede sig fra dets ventrale side. Røret var med andre ord at opfatte, som et fælles anlæg for hypophysis og centralnervesystem, et forhold der forekom mig at faa forøget interesse derved, at det ogsaa hos laryerne lykkedes mig at vise, at disse organer fremgaar fra et fælles rørformigt anlæg (medullarrøret) om end her udviklingen forløber anderledes og frembyder mere complicerede forhold.

Derimod lykkedes det mig ikke med sikkerhed at afgjøre, hvorfra hjertet og pericardiet anlægges, idet jeg fandt det første anlæg til disse organer som en liden cellehob beliggende ved knoppens bagre høire side.

*Pizon* beskriver derimod det første anlæg som en udbugtning af den indre blære (sous forme d'un petit diverticule inférieur de la vésicule endodermique primitive, (48 a, pag. 150). Denne meddelelse stemmer fuldt ud med, hvad vi for *Perophoras* vedkommende meddelte efter *Kowalevsky*. Den lille cellehob har først intet distinct lumen, siden omdanner den sig til en blære, der saavel indeholder anlægget til hjertet som til pericardium og af denne dannes hjertet ved udbugtning, en proces, der er vel kjendt fra *van Beneden* og *Julin*'s undersøgelser.

Generationsorganerne vandrer eller forskyves fra moderdyret ind i knopperne. Det synes efter mine undersøgelser, som om generationsorganerne udvikler sig mere eller mindre uafhængigt af knoppen, idet jeg snart fandt ganske unge knopanlæg med store ægfollikler, snart ældre knopper uden eller med ganske smaa ægceller. Æggenes resp. testiklernes udvikling antages ogsaa at fortsætte sig gennem flere generationer, et forhold, der forekommer mig særdeles eiendommeligt, og som jeg ikke vover at give nogen forklaring for. Ligesaa eiendommeligt er det forhold, at de første spor til generationsorganer først viste sig i den 4de generation fra ægget af.

Som ovenfor nævnt stemmer denne fremstilling i hovedpunkterne overens med *Pizon*'s og *Oka*'s arbejder. An-

mediately as a saddle-shaped double vesicle, which thus from the very first surrounds the branchial gut on both sides and dorsally (See Pl. IX, fig. 8). Forwards from the peribranchial cavity, there early grows a caecally-ending tube, whose posterior opening is seen in the above text-figure (See also Pl. IX, fig. 6). This tube, which I succeeded in following through all the stages in longitudinal and transverse sections, thereupon coalesces with the branchial gut in front, and thus forms a tubular connection between the branchial sac and the peribranchial cavity (Pl. IX, fig. 7).

During its further development, the tube is constricted from the peribranchial cavity, while it closes behind, and we then find it, as figured on Pl. IX, fig. 8, communicating only with the branchial sac in front. We will call this tube the „dorsal tube“, so as not to anticipate anything concerning its future destiny and significance.

While *Pizon* and *Oka* both think that the dorsal tube only forms the hypophysis, I found that the ganglion was constricted from its ventral side. In other words, the tube must be considered as a common rudiment of the hypophysis and the central organs of the nervous system, a circumstance which seemed to me to gain fresh interest from the fact that in the larva too, I succeeded in showing that these organs originate in a common tubular rudiment (the medullary tube), although here the course of development is otherwise, and presents more complicated conditions.

On the other hand, I did not succeed in determining with certainty where the heart and the pericardium originate, as I found the earliest rudiment of these organs in the form of a little mass of cells situated to the right of the posterior side of the bud.

*Pizon*, on the other hand, describes the earliest rudiment as an evagination of the inner vesicle (sous forme d'un petit diverticule inférieur de la vésicule endodermique primitive“, 48 a, p. 150). This statement agrees perfectly with what we recorded from *Kowalevsky*, as regards *Perophora*. The little mass of cells has at first no distinct lumen; it is subsequently converted into a vesicle, which contains the rudiments of both the heart and the pericardium, and from which the heart is formed by evagination, a process that is well known from *van Beneden* and *Julin*'s investigations.

The generative organs wander, or are displaced from the parent animal into the buds. From my investigations, it seems to me that the generative organs develop more or less independently of the bud, for I sometimes found quite young, rudimentary buds with large egg-follicles, at others, older buds without any, or with only very small egg-cells. The development of the eggs, as of the testicles, is also probably continued through several generations, a fact which seems to me most peculiar, and of which I will not venture to give any explanation. Equally peculiar is the circumstance that the first trace of generative organs appeared in the fourth generation from the egg.

As mentioned above, this account agrees in the main with *Pizon*'s and *Oka*'s works. With regard to certain



gaaende enkelte divergerende detaillier henviser jeg her alene for oversigtens skyld til mine tidligere bemærkninger til de nævnte arbejder (31, pag. 613 ff; 33, pag. 218). Som man kan forstaa, kalder *Pizon* knoppernes indre blære for entodermal, da han anser larvernes peribranchialsæk for en udbugtning af tarmen (Se kap. I).

Nervesystemet dannes efter *Pizon* som en fin nerve-streng, der vokser ud fra moderdyret ind i knopperne, et forhold, som forfatteren dog ikke formaaede direkte at iagt-tage, og som ikke har faaet nogen bekræftelse af nogen senere forfatter. Det samme gjælder *Okas* mening, at enkelte ektodermceller skulde løse sig fra epidermis og vandre hen til dorsالرrøret og her ved dettes underside danne gangliet.

Sammen med Frk. *Bonnevie* har jeg siden undersøgt en *Sarcobotryllide*, der udmerkede sig ved særdeles store yderst fordelagtige knopper og her fandt vi de smukkeste overgangsstadier fra det encellede dorsالرrør til gangliets afsnøring fuldt overensstemmende med mine figurer Pl. 38, fig. 25—30. Ogsaa hos talrige andre grupper er denne gangliets dannelsesmaade bleven bekræftet af senere forfattere, specielt *Ritter* og *Caullery* (se nedenfor) og i den allerseneste tid har *Lefèvre* undersøgt *Botryllus*-knopperne paany og fuldstændig bekræftet min opfatning. Han siger (42, pag. 77): „I might also state that my sections entirely confirm *Hjort's* description of the formation of the ganglion, and directly contradict *Pizon's* statement, that the constriction of the ganglion from the dorsal tube cannot be established“. Han giver ogsaa herfor figurer, som paa det nøieste stemmer med mine præparater. En lignende beskrivelse er ogsaa nylig given af *Ritter* for *Goodsiria*, der tilhører gruppen *Polystyelidæ* (50). Knopskydningen er ogsaa her „palleal“ og dorsالرrøret dannes som hos *Botryllus*. For *Botryllidernes* vedkommende turde derfor dette spørgsmaal nu være uddebateret, og dermed synes mig et særdeles vigtigt embryologisk problem løst.

#### *Distaplia magnilarva.*

For denne gruppes vedkommende henviser jeg til den foregaaende afhandling af *Bonnevie*, der indeholder en nærmere oversigt af litteraturen specielt *Kowalevsky's* og *Salensky's* tidligere undersøgelser.

De selvstændige undersøgelser, som jeg har anstillet sammen med Frk. *Bonnevie*, og hvis resultater er offentliggjort i en foreløbig meddelelse (34), bekræfter helt ud *Kowalevsky's* ældre arbeide (38).

Allerede af *Della Valles* ældre afhandling (13) er det bekjendt, at knoppens indre blære afsnøres fra tarmlræktus. I kap. 2 beskrev jeg under henvisning til fig. 9, pl. XII, hvorledes de smaa knopper dannes.\*)

divergent details, I will only refer, for the sake of the survey, to my previous remarks on the above works (31, p. 613, etc.; 33, p. 218). *Pizon*, as will be easily understood, calls the inner vesicle of the bud endodermal, as he considers [the larva's peribranchial cavity to be an evagination of the intestine (see Chapter I).

According to *Pizon*, the nervous system is formed in the shape of a fine nerve cord, growing out of the parent animal into the bud, a circumstance, however, which he did not observe directly, and which has not received confirmation from any subsequent writer. The same remark applies to *Okas* theory that certain ectoderm cells detached themselves from the epidermis, and passed into the dorsal tube, on the under side of which they formed the ganglion.

Together with Miss *Bonnevie*, I have since examined a *Sarcobotryllid* which was distinguished by the unusually large size of its buds, which afforded very favorable conditions for examination. Here we found most perfect transition stages from the single-celled dorsal tube to the constriction of the ganglion, agreeing fully with my figures, Pl. 38, figs. 25—30. In numerous other groups too, the manner of this ganglion's formation has been confirmed by subsequent writers, especially *Ritter* and *Caullery* (see below); and quite recently *Lefèvre* has re-examined *Botryllus* buds, and fully confirmed my theory. He says (42, p. 77): „I might also state that my sections entirely confirm *Hjort's* description of the ganglion, and directly contradict *Pizon's* statement that the constriction of the ganglion from the dorsal tube cannot be established.“ He also gives figures for this, which exactly agree with my preparations. A similar description has also been lately given by *Ritter* of *Goodsiria*, which belongs to the group *Polystyelidæ* (50). The budding here too is pallial, and the dorsal tube is formed as in *Botryllus*. This question, therefore, as far as *Botryllidæ* is concerned, may be considered sufficiently debated, and thereby, as it seems to me, an exceedingly important embryological problem solved.

#### *Distaplia magnilarva.*

As regards this group, I would refer to the preceding paper by *Bonnevie*, which contains a detailed survey of the literature, especially *Kowalevsky's* and *Salensky's* earlier investigations.

The investigations which Miss *Bonnevie* and I have pursued, the results of which have been published in a preliminary statement (34) fully confirm *Kowalevsky's* older work (38).

It was already known from *Della Valle's* older treatise (13) that the inner vesicle of the bud is constricted from the intestine. In Chapter II, I described, when referring to Pl. XII, fig. 9, how the small buds were formed.\*)

\*) Ifølge de nyere undersøgelser af *Julin* (se pag. 21) dannes knoppernes indre blære fra et epicardium, en dannelse vi ogsaa har fundet hos knopperne (se Pl. IX, fig. 9—13).

\*) According to *Julin's* later investigations (see note p. 21), the inner vesicle of the buds is formed from an epicardium, a formation which we also have found in the bud (see Pl. IX, figs. 9—13).



Figurerne 9 og 10, pl. IX fremstiller nu de første stadier af det unge knopsanlægs videre udvikling. Figur 10 er seet fra dorsalsiden, fig. 9 fra venstre side. Man ser her anlægget til peribranchialsækken opstaa som 2 blæreformige udbugtninger af den indre blære.

Dorsalrøret dannes endvidere her som en tubusformig udbugtning af den indre blære, og fra det parti af denne, der danner gjælletarmen. Nogen forskjel viser dette fra *Botrylliden*, hvor dorsalrøret opstod fra eller bedre sammen med peribranchialsækken.

Tarmen bugter sig ud ganske som hos *Botryllus* og *Perophora*. Man iagttager endvidere her ventralt og bagtil et U-formigt rør, der med begge ender munder ud i tarmen; dette er det rudimentære epicardium.

Figurerne 11 og 12 (pl. IX) viser os et ældre stadium, hvor de 2 peribranchialsækanlæg har forenet sig, og hvor dorsalrøret bagtil har løst sig fra tarmen. Fig. 13 viser endvidere en endnu ældre knop, hvor gjællespalterne er dannede, ingestions- og egestionsaabningen dannet, dorsalrøret munder ud i gjælletarmen fortil og viser fortykkelsen til gangliet dorsalt.

Se angaaende den videre udvikling og litteraturen foranstaaende afhandling og vor forelobige meddelelse. Siden dennes offentliggjørelse er vore resultater bekræftede af *Caullery* (9).

### Clavelina.

Over denne gruppe har *Seeliger* tidligere (57) anstillet undersøgelser, der i flere henseender har ført til andre resultater end de, der her er meddelt for andre familiers vedkommende. I et senere arbejde (60) har han imidlertid meddelt, at han efter fornyede undersøgelser, udført under gunstigere omstændigheder\*) har rundet en anden opfatning, idet han siger: „Ich habe (daher) im Sommer des vorigen Jahres eine nochmalige Untersuchung vorgenommen, und meine Beobachtungen waren bereits bis auf einen einzigen Punkt abgeschlossen, als die beiden vorläufigen Mittheilungen von *Hjort* und *Willey* erscheinen, mit denen sie im wesentlichsten vollkommen übereinstimmen“. Efter denne udtalelse der er af stor vigtighed, idet den ogsaa muliggjør en hensyntagen til *Clavelina* i den almindelige betragtning af knopskydningen, tillader jeg mig at forbigaa *Seeligers* ældre arbejde, som jeg dog skal komme tilbage til i den generelle del, da vore theoretiske synspunkter i de væsentligste punkter støtter hinanden, om de end oprindeligt er rundne ud fra forskellige udviklingshistoriske fakta.

\*) *Seeliger* gjør opmærksom paa, at hans tidligere undersøgelser udførtes før den moderne snitteknik. Enhver, der har arbejdet med *Ascidie*-knopperne vil forstaa, hvor vanskelig det under saadanne forhold maa have været at vinde en forstaaelse i dette kapitel af udviklingshistorien.

Figs. 9 and 10 on Pl. IX, show the earliest stages of the further development of the young rudimentary bud. Fig. 9 is a view from the left side, fig. 10 from the dorsal side. The rudiment of the peribranchial cavity is here seen to originate as 2 vesicular evaginations of the inner vesicle.

The dorsal tube is moreover formed here as a tubular evagination of the inner vesicle, and from that part of it which forms the branchial sac. This presents some difference from the *Botryllidae*, where the dorsal tube originated in, or rather together with the peribranchial cavity.

The intestine bulges out as in *Botryllus* and *Perophora*. There may also be seen here, ventrally and posteriorly, a U-shaped tube, opening at both ends into the intestine. This is the rudimentary epicardium.

Figs. 11 and 12 (Pl. IX) show a more advanced stage, where the 2 rudiments of the peribranchial cavity have become united, and the dorsal tube behind has detached itself from the intestine. Fig. 13 shows a still older bud, where the branchial stigmata and the oral and atrial apertures are formed, and where the dorsal tube opens out in front into the branchial gut, and exhibits dorsally the thickening for the ganglion.

For the further development and bibliography, see the preceding paper, and our preliminary account. Since the publication of the latter, our results have been confirmed by *Caullery* (9).

### Clavelina.

*Seeliger* (57) has previously made investigations of this group, which in many respects have led to results different from those which have here been given with regard to other families. In a more recent work, however (60), he has stated that after fresh investigations, pursued under more favorable conditions\*), he has come to a different conclusion, for he says: „Ich habe (daher) im Sommer des vorigen Jahres eine nochmalige Untersuchung vorgenommen, und meine Beobachtungen waren bereits bis auf einen einzigen Punkt abgeschlossen, als die beiden vorläufigen Mittheilungen von *Hjort* und *Willey* erschienen, mit denen sie im wesentlichsten vollkommen übereinstimmen“. After this statement, which is of great importance, as it also renders reference to *Clavelina*, in the ordinary view of budding, possible, I venture to pass over *Seeliger's* earlier work, to which I shall return in the general section, as our theoretical points of view, in the main, support one another, although originally obtained from different developmental-historical results.

\*) *Seeliger* points out that his earlier investigations were made before the present perfection in the means of making sections was arrived at. Anyone who has studied *Ascidian* buds will understand how difficult it must have been, under such circumstances, to gain a comprehension of this chapter of their developmental history.

### Pyrosoma.

Knopudviklingen er, som almindelig bekendt, knyttet til den saakaldte „stolo prolifer“. Denne danner ikke alene et men flere individer, et forhold, der er meget karakteristisk for *Pyrosoma*. Paa pl. X, fig. 1, der er kopieret efter *Seeliger*, ser vi 2 knopper. Det viser sig da altid, at den knop, der ligger fjernest fra moderdyret er mest udviklet. Da den foreliggende afhandling alene har stillet sig til opgave at belyse organudviklingen og organernes anlæg hos de forskjellige grupper holder vi os alene her til den enkelte knop.

Denne bestaar altsaa i sit første anlæg af en „ydre blære“, moderdyrets epidermis, og en „indre blære“, en udbugning af moderdyrets tarmløse, altsaa af entodermal oprindelse. Organdannelsen er af tidligere forfattere beskrevet paa en særdeles eiendommelig maade. Vi følger af flere grunde *Korschelt* og *Heider*s udmerkede fremstilling heraf. Pag. 1392 siger de: „An Querschnitten durch junge, in der Bildung begriffene Stolonen erkennt man auch bereits zu beiden Seiten des Entodermfortsatzes die Anlagen der Peribranchialröhren. Woher diese Anlagen stammen, ist bisher nicht genau beobachtet. Da sie jedoch mit ihren distalen Enden in einem gewissen Zusammenhang mit dem Genitalstrang gefunden werden, so ist *Seeliger* geneigt, sie von dem letzteren abstammen zu lassen. *Seeliger* betrachtet demnach die Peribranchialröhren in den Kospen der Pyrosomen als mesodermale Gebilde, obwohl dieselben im Cyathozoid und in den vier ersten Ascidiozoiden unzweifelhaft dem Ectoderm entstammen. Aber auch die Anlage des Nervenrohres des Knospenstockes soll nach *Seeliger* dem Genitalstrange entstammen. An ganz jungen Stolonen scheint sich nämlich das distale Ende des letzteren um die Spitze des Entodermfortsatzes herum an die obere Seite zu krümmen.“ „Diese obere Parthie des Genitalstranges schnürt sich im weiteren Verlaufe der Entwicklung von dem Genitalstrange ab und wird nach *Seeliger* zur Anlage des Nervenrohres.“

„Nach *Seeliger* stammen demnach nicht bloss die Geschlechtsorgane der Knospen sondern auch die Peribranchialröhren, das Nervensystem und ein grosser Theil sämtlicher mesodermaler Gebilde von dem Genitalstrange ab. Für *Seeliger* hat demnach jene Zellgruppe, welche wir einfach als Anlage des Genitalstranges bezeichneten, eine viel weitergehende Bedeutung für die Ausbildung des Stolo prolifer. Er bezeichnet sie deshalb auch als Keimstrang oder mesodermale Keimmasse.“

Da jeg ioverensstemmelse med *Korschelt* og *Heider* fandt denne fremstilling i høieste grad afvigende ikke alene fra de øvrige Ascidiens knopskydning men ogsaa fra almindelige embryologiske synspunkter paabegyndte jeg et studium af *Pyrosoma*, et arbejde som siden er optaget og fuldført af frk. *Bonnevie*. Herved har det da ogsaa vist sig, at *Pyrosoma* i ingen henseende afviger fra det schema jeg har skildret for de øvrige Ascidier. Angaaende de nærmere detaillier og en indgaaende diskussion af litteraturen henvises til foregaaende afhandling, her vil jeg kun

### Pyrosoma.

The bud-development, as is generally known, is associated with the so-called „stolo prolifer“. This forms not only one, but several individual animals, a circumstance which is very characteristic of *Pyrosoma*. On Pl. X, fig. 1, which is copied from *Seeliger*, we see 2 buds. It invariably appears that the bud lying farthest from the parent animal is the most highly developed. As the sole object of the present paper is the elucidation of organic development and the incipency of the organs in the various groups, we will confine our remarks to the one bud.

This then consists, in its earliest commencement, of an „outer vesicle“, the epidermis of the parent animal, and an „inner vesicle“, an evagination of the intestine of the parent animal, and therefore of endodermal origin: The formation of the organs has been described by earlier writers in a very peculiar manner. For several reasons, we will take *Korschelt* and *Heider*'s excellent account of it. On p. 1392, they say: „An Querschnitten durch junge, in der Bildung begriffene Stolonen erkennt man auch bereits zu beiden Seiten des Entodermfortsatzes die Anlagen der Peribranchialröhren. Woher diese Anlagen stammen, ist bisher nicht genau beobachtet. Da sie jedoch mit ihren distalen Enden in einem gewissen Zusammenhang mit dem Genitalstrang gefunden werden, so ist *Seeliger* geneigt, sie von dem letzteren abstammen zu lassen. *Seeliger* betrachtet demnach die Peribranchialröhren in den Knospen der Pyrosomen als mesodermale Gebilde, obwohl dieselben im Cyathozoid und in den vier ersten Ascidiozoiden unzweifelhaft dem Ectoderm entstammen. Aber auch die Anlage des Nervenrohres des Knospenstockes soll nach *Seeliger* dem Genitalstrange entstammen. An ganz jungen Stolonen scheint sich nämlich das distale Ende des letzteren um die Spitze des Entodermfortsatzes herum an die obere Seite zu krümmen.“ „Diese obere Parthie des Genitalstranges schnürt sich im weiteren Verlaufe der Entwicklung von dem Genitalstrange ab, und wird nach *Seeliger* zur Anlage des Nervenrohres.“

„Nach *Seeliger* stammen demnach nicht bloss die Geschlechtsorgane der Knospen sondern auch die Peribranchialröhren, das Nervensystem und ein grosser Theil sämtlicher mesodermaler Gebilde von dem Genitalstrange ab. Für *Seeliger* hat demnach jene Zellgruppe, welche wir einfach also Anlage des Genitalstranges bezeichneten, eine viel weitergehende Bedeutung für die Ausbildung des Stolo prolifer. Er bezeichnet sie deshalb auch als Keimstrang oder mesodermale Keimmasse.“

As I found, with *Korschelt* and *Heider*, that the budding thus described differed very much, not only from that of the other Ascidians, but also as regarded ordinary embryological points of view, I began a study of *Pyrosoma*, a work which has since been taken up and completed by Miss *Bonnevie*. It has proved from this that *Pyrosoma* in no way differs from the schema that I have given for the other Ascidians. For the more minute details, and for a thorough discussion of the literature, I will refer to the preceding paper, and will here only state the principal



meddele hovedtrækkene af knopskydningens forløb, efter frk. Bonneries meddelelse.

Den første antydning til stoloens videre udvikling viser sig særdeles tidlig. „hvor knoppen endnu kun sees som en liden udbugtning paa moderdyret“. Peribranchialsækkene anlægges nemlig da ud fra stoloens indre blære paa den maade, at dennes epithelvægge viser to laterale fortykkelser, der siden vokser ud som to laterale epithelplader uden lumen.

Naar da siden den unge knop er anlagt finder man, som tidligere bekjendt, og som ovenfor meddelt efter Heiders beskrivelse, disse anlæg paa høire og venstre side af entodermrøret; kun forbliver de længere tid i forbindelse med dette. „Nerverøret“ (dorsalrøret vilde her ikke være en helt ud træffende betegnelse) anlægges endnu, før peribranchialsækkens forbindelse med entodermrøret er afbrudt ud fra begge de to peribranchialsækanlæg, idet disse forbindes med hinanden ved et rør, der bagtil vokser rundt tarmen (se fig. 2, pl. X); og samtidig dermed eller umiddelbart derefter dannes anlægget til 2 epitheltappe, der i form af solide strenge vokser forover og forener sig rundt tarmen. Inde i den store cellemasse ved dette foreningspunkt dannes nu et hulrum (lumen) endnu, før noget saadant forekommer i epithelstrengene. Man finder den saaledes skildrede proces illustreret af figurerne 2 og 3, pl. X. Under den videre udvikling løsner nervesystemet sig efterhaanden fra sammenhængen med peribranchialsækken (fig. 4 og 5, pl. X).

Udviklingens videre forløb foregaar nu som almindelig bekjendt fra tidligere arbejder. Gangliet afsnores fra nerverørets dorsale side (*Seeliger*) de 2 anlæg til peribranchialsækken forener sig til dannelsen af cloaken. Nervesystemets 2 rør, der omgiver tarmen trækkes ud til fine traade. (Se forøvrig foranstaaende afhandling og *Korschelt* og *Heiders* lærebog).

#### Didemnidæ og Diplosomidæ.

Denne gruppe er blevet studeret af *Gegenbaur*, *Ganin*, *Giard*, *Della Valle* (13), *Salensky* (55) og *Caullery* (9, pag. 101 ff. Kap. Sur la morphologie des bourgeons des Didemnidæ).

Jeg følger her *Caullery's* indgaaende undersøgelser og henviser angaaende den ældre litteratur til hans arbejde.

I overensstemmelse med tidligere undersøgelser konstaterede *Caullery*, at hver knop hos *Diplosoma gelatinosum* fremgaar af 2 knopanlæg, nemlig en „bourgeon thoracique“ og en „bourgeon abdominal“.

Medens man tidligere mente, at „bourgeon thoracique“ fremgik som en udbugtning af tarmlæget, fandt *Caullery*, at der hos *Diplosoma* findes et distinkt udviklet epicardium, og at knopanlægget dannes, idet en udbugtning af dettes

features in the course of budding, according to Miss *Bonnerie's* account.

The first indication of the further development of the stolon, appears very early, „when the bud only appears like a slight swelling on the mother animal“. The peribranchial cavities then begin to form from the inner vesicle of the stolon, the epithelial walls of that vesicle showing two lateral thickenings, which subsequently grow out as two lateral, epithelial lamellæ, without a lumen.

When, later on, the young bud commences to form, these rudiments are found, as already known, and as stated above from *Heider's* description, on the right and left sides of the endodermal tube; only they remain for a longer time in connection with it. The „nerve-tube“ (dorsal tube would not be an altogether appropriate term here (originates, even before the connection of the peribranchial cavity with the endodermal tube is broken off, from the 2 rudiments of the peribranchial cavity, these being connected with one another by a tube which at the back grows round the intestine (see Pl. X, fig. 2); and simultaneously, or immediately after, the rudiments of 2 epithelial processes are formed, which grow forward in the form of solid cords, and unite round the intestine. Within the large mass of cells at this point of union, a cavity (lumen) is now formed, before anything of the kind occurs in the epithelial cords. The process here described will be found illustrated on Pl. X, figs. 2 and 3. During the further development, the nervous system detaches itself by degrees from its connection with the peribranchial cavity (Pl. X, figs. 4 and 5).

The further development now proceeds in the manner generally known from earlier works. The ganglion is constricted from the dorsal side of the nerve-tube (*Seeliger*), and the 2 rudiments of the peribranchial cavity unite to form the cloaca. The 2 tubes of the nervous system, which encircle the intestine, are drawn out into fine filaments. (See also the preceding paper, and *Korschelt* and *Heider's* text-book).

#### Didemnidæ and Diplosomidæ.

This group has been studied by *Gegenbaur*, *Ganin*, *Giard*, *Della Valle* (13), *Salensky* (55) and *Caullery* (9, p. 101, etc.; Chap. Sur la morphologie des bourgeons des Didemnidæ).

I will here follow *Caullery's* minute investigations, and direct attention to his work for information regarding the earlier literature.

In accordance with earlier investigations, *Caullery* demonstrated that every bud in *Diplosoma gelatinosum* proceeds from 2 bud-rudiments, namely, a „bourgeon thoracique“ and a „bourgeon abdominal“.

Whereas it was once thought that the „bourgeon thoracique“ appeared as an evagination of the intestine, *Caullery* found that in *Diplosoma* there is a distinctly developed epicardium, and that the bud-rudiment is formed



væg afrunder sig til knopanlæggets „indre blære“, der igjen foraarsager en udbugtning af moderdyrets epidermis („den ydre blære“).

Fra den indre blære dannes nu peribranchialsækken som hos de fleste andre Ascidieknopper ved 2 udbugtninger, der snart smelter sammen dorsalt til en enkelt peribranchialsæk. Dorsalrøret dannes som „un diverticule, partant du tube épocardique gauche, à la base de la cavité branchiale“ (pag. 106).

*Caullery* gjør opmærksom paa den store overensstemmelse, som denne dorsalrørets dannelse har hos *Didemnidæ* og den følgende gruppe, der her skal beskrives nemlig gruppen *Amaroucium*—*Polyclinum*. Dorsalrøret vokser siden sammen med gjællertarmen fortil, gangliet afsnører paa rørets dorsale side (se forøvrig næste gruppe). Det unge knopanlæg er nu siger *Caullery* bygget ganske som en ung *Polyclinum*-knop. (Sammenlign min fig. 10, pl. X, fig. 1, pl. XI). Fra det høire epicardium vokser der nu ud en cylinderformig udbugtning der vokser hen til moderdyrets øsophagus og smelter sammen med dette. Fra samme sted (altsaa fra moderdyrets øsophagus) vokser „le bourgeon abdominal“ ud som udbugtning der danner knoppens tarmkanal med undtagelse af øsophagus og rectum. Knoppens øsophagus dannes altsaa af den cylinderformige udbugtning af „le bourgeon thoracique“ høire epicardium, og denne forbinder sig med „le bourgeon abdominal“ derved at det smelter sammen med moderdyrets øsophagus paa det sted hvorfra abdominalknoppen vokser ud. Abdominalknoppen vokser nu igjen hen til moderdyrets rectum og vokser sammen med dette, og fra samme sted vokser knoppens rectum hen til knoppens peribranchialsæk.

Ved denne komplicerede udviklingsproces opstaar da de mærkelige dobbeltindivider, hvis to tarmtracti indbyrdes er forenede i sine øsophageal- og rectalpartier. Se nedenforstaaende figurer.

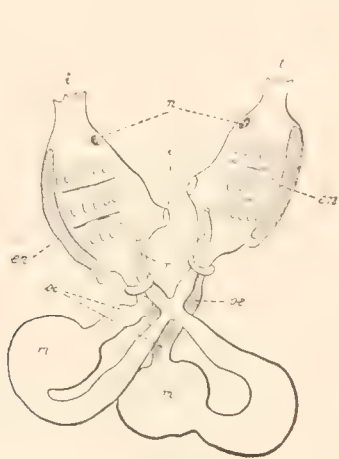


Fig. 9.

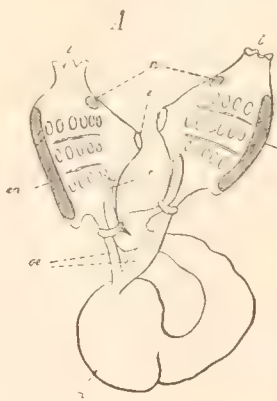


Fig. 10.

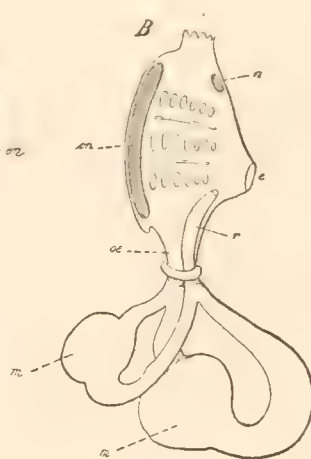


Fig. 11.

Fig. 9—11 af *Korschelt-Heider* efter *Della-Valle*.

*e* = Egestionsaabning, *en* = Endostyl, *i* = Ingestionsaabning, *m* = Mave (ventrikel), *n* = Centralnervesystem, *r* = Rectum.

by the rounding off of an evagination of its wall (the inner vesicle), which, in its turn, occasions an evagination of the epidermis of the parent animal (outer vesicle).

From the inner vesicle the peribranchial cavity is now formed, as in most other Ascidian buds, by 2 evaginations, which soon coalesce dorsally to a single peribranchial cavity. The dorsal tube is formed as „un diverticule partant du tube épocardique gauche, à la base de la cavité branchiale“ (p. 106).

*Caullery* draws attention to the great similarity that the formation of this dorsal tube has in *Didemnidæ* and the group to be next described here, namely *Amaroucium*—*Polyclinum*. The dorsal tube subsequently coalesces with the branchial sac in front, and the ganglion is constricted on the dorsal side of the tube (See also the next group). The young bud-rudiment is now, says *Caullery*, exactly like a young *Polyclinum* bud in structure (cf. my Pl. X, fig. 10 and Pl. XI, fig. 1). From the right epicardium there now springs a cylindrical evagination, which grows up to the parent-animal's øsophagus, and coalesces with it. Out of the same place (that is from the øsophagus of the parent animal), grows „le bourgeon abdominal“, in the shape of an evagination which forms the whole of the intestinal canal of the animal, with the exception of the øsophagus, and the rectum. The øsophagus of the bud is thus formed by the cylindrical evagination of the right epicardium of „le bourgeon thoracique“, which is united to „le bourgeon abdominal“ by coalescing with the øsophagus of the parent animal at the place where the abdominal bud grows out. The abdominal bud now grows again up to the rectum of the parent animal, and coalesces with it, and from the same place, the rectum of the bud grows up to the bud's peribranchial cavity.

By this complicated developmental process arise those remarkable double animals, whose alimentary canals are mutually united in their øsophageal and rectal regions (see figures below).

Figs. 9—11, from *Korschelt and Heider*, after *Della Valle*. *e* = atrial aperture; *en* = endostyle; *i* = oral aperture; *m* = stomach (ventricle); *n* = central organs of the nervous system; *r* = rectum.

Af den givne fremstilling af knopskydningen vil man forstaa, at ét individum faar to tarmtrakti, naar kun abdominalknoppen dannes (tekstfigur 11); ligeledes at to thoracaldele anlægges, naar alene thoracalknoppen kommer til udvikling.

Hjertet og perikardiet dannes efter *Caullery* fra en udbugtning af epikardiets distale ende.

Ved disse *Caullerys* udmerkede undersøgelser er ogsaa denne familie bragt i overensstemmelse med de andre.

### Polycliniderne.

I sin grundlæggende afhandling: „Ueber die Knospung der Ascidien“ har *Kowalevsky* ogsaa behandlet *Polycliniderne*, idet han studerede *Amaroucium proliferum*. Som nævnt i kap. 2 dannes knopperne derved, at moderdyrets postabdomen paatvers deles i 4 à 5 dele, der hver udvikler sig til en knop. (Se pl. X, fig. 7 og 8). Knopanlæggets indre blære fremgaar da umiddelbart af postabdomens „skillevæg“, der som vi saa i kap. 1 er en fortsættelse af epikardiet. Det lykkedes mig at bekræfte dette punkt, idet jeg først hos larverne af *Amaroucium roseum* fandt anlægget til epicardiet som en liden dobbelt udbugtning af tarmtraktus'oesophagealparti (fig. 6, pl. X), dernæst hos individer, der havde gennemgaaet larvernes metamorphose fandt epicardiet som et langt rør, der distalt støttede sig til perikardiet og centralt indmundede i tarmtraktus ved Y-formige forgreninger paa den bekjendte først af *van Beneden* og *Julin* beskrevne maade (se pl. X, fig. 9). Idet nu epicardiet sterkt forlænges og herunder skyver hjertet med dets pericardium ud i en hududbugtning dannes postabdomen, som vi finder den beskrevet af *Kowalevsky* (fig. 7, pl. X), hvor epicardiet sees i postabdomens midte som et ganske fint rør. Det vil herved være bevist, at knoppernes indre blære dannes fra moderdyrets epicardium og at dette er en entodermal dannelse (se pl. X, fig. 8). *Kowalevsky's* videre beskrivelse af knopskydningens forløb stemmer nu i høj grad overens med det tidligere for andre grupper meddelte skema, om den end i flere detaljer afviger fra de senere undersøgelser af *Pizon* (48 a), forfatteren (31) og *Caullery* (9). I det følgende skal jeg først meddele knopskydningens forløb efter mine egne undersøgelser og skal jeg derefter omtale de forskellige afvigelser.

Fig. 1, pl. XI og fig. 10, pl. X giver et billede af et ungt stadium, der giver os en forklaring over alle de første udviklingsprocesser. Man ser, at den ydre blære ligesom hos de andre grupper ikke deltager i organernes dannelse. Den indre blære undergaar imidlertid flere samtidigt foldeprocesser. Paa hoire og venstre side bugtes de 2 anlæg til dannelsen af peribranchialsækken ud. Hvad der imidlertid her er eiendommeligt er at dorsalt røret bugtes ud sammen med venstre peribranchialsækanlæg (se pl. X,

From the above description of this budding, it will be understood that one animal has two intestines when only the abdominal bud is formed (text-figure 11); also that two thoracic parts commence to form when only the thoracic bud is developed.

The heart and pericardium are formed according to *Caullery* from an evagination of the distal end of the epicardium.

By these remarkably good investigations of *Caullery's*, this family also is brought into harmony with the others.

### Polyclinidæ.

In his fundamental treatise „Ueber die Knospung der Ascidien“, *Kowalevsky* has also treated of the *Polyclinidæ*, having studied *Amaroucium proliferum*. As stated in Chapter II, the buds are formed by a transverse division of the post-abdomen of the parent animal into 4 or 5 parts, each of which develops into a bud (see Pl. X, figs. 7 and 8). The inner vesicle of the rudimentary bud arises immediately from the septum of the post-abdomen, which, as we saw in Chapter I, is a continuation of the epicardium. I succeeded in confirming the accuracy of this point, having first in larvæ of *Amaroucium roseum* found the rudiment of the epicardium as a little double evagination of the oesophageal part of the intestine (Pl. X, fig. 6), and then in animals that had undergone the larval metamorphosis, I found the epicardium as a long tube which rested against the pericardium distally, and centrally opened into the alimentary canal by Y-shaped ramifications in the well-known manner first described by *van Beneden* and *Julin* (see Pl. X, fig. 9). With the great increase in length of the epicardium, whereby the heart and its pericardium are pushed out into a cuticular evagination, the post-abdomen is formed as we find it described by *Kowalevsky* (Pl. X, fig. 7), where the epicardium is visible in the middle of the post-abdomen as a very thin tube. This will serve to prove that the inner vesicle of the bud is formed from the epicardium of the parent-animal, which is an endodermal formation (see Pl. X, fig. 8). *Kowalevsky's* further description of the course of budding agrees very exactly with the plan given previously for other groups, although it differs in several details from the more recent investigations of *Pizon* (48 a), the present writer (31) and *Caullery* (9). I will here first describe the course of budding according to my own investigations, and will then mention the various deviations.

Pl. XI, fig. 1 and Pl. X, fig. 10 illustrate a very early stage, which affords us an explanation of all the earliest developmental processes. It will be seen that the outer vesicle, as in the other groups, does not take part in the formation of the organs. The inner vesicle, however, undergoes several simultaneous folding processes. On the right and left sides, the 2 rudiments for the formation of the peribranchial cavity bulge out. The remarkable thing here, however, is that the dorsal tube bulges out



fig. 10). Tarmtraktus bugtes ud som hos de andre grupper, og bagtil deles den indre blære ved en median sammenklæbning af den ventrale og dorsale væg i 2 rør, der dog staar i forbindelse med hinanden bagtil. Tversnitserien fig. 2—7, Pl. XI illustrerer dette stadium (Pl. XI, fig. 1). Fig. 2, der er et snit langs linien  $\alpha-\beta$  (fig. 1) viser i sin midte gjællertarmen  $KD$ , paa dennes sides venstre og høire peribranchialsækanlæg, og mellem disse den forreste lukkede spids af dorsaleret. Fig. 3 (langs linien  $\gamma-\delta$ , fig. 1), viser dorsaleret som virkeligt rør. Fig. 4 og 5 (langs linierne  $\epsilon-\xi$  og  $\eta-\theta$ , fig. 1) viser til høire hvorledes det høire peribranchialsækanlæg og til venstre, hvorledes det venstre peribranchialsækanlæg og dorsaleret sammen munder ud i gjællertarmen. Paa disse figurer ser man da ligeledes at gjællertarmen bagtil gaar over i 2 store rør, knoppens epicardium. Paa fig. 6 (langs linien  $\iota-z$ , fig. 1) sees epicardiet som 2 ganske adskilte rør, der dog længere bagtil, fig. 7, smelter sammen igjen.

Man vil ved sammenligning med de tidligere grupper forstaa, hvorledes de saaledes beskrevne forhold videre udvikler sig til det i fig. 11, pl. X afbildede stadium. Dette er især karakteristiske derved, at de 2 anlæg til peribranchialsækken smelter sammen, at dorsaleret væsentlig forlænges og især smalner af (trækkes ud) bagtil, medens det dog endnu viser en forbindelse med peribranchialsækken og gjællertarmen bagtil. Tarmtraktus er vokset, ligesaa epicardiet i sit bagre parti.

Det fig. 12, pl. X afbildede stadium er nu igjen væsentligt ældre. Peribranchialsækkens forbindelse med gjællertarmen er helt afsnøret; ligesaa er dorsaleret bagtil skilt fra peribranchialsækken. Derimod har det fortil som hos de andre grupper forenet sig med gjællertarmen, og man iagttager paa dets forreste dorsale parti en væsentlig fortykkelse til dannelse af gangliet, samtidig med at dets bagre parti er trukket ud til et langt fint rør, der paa tværsnit viser sig encellet. Jeg har nu paa talrige snitserier studeret dorsaleret paa dette stadium og det har med afgjørende sikkerhed vist sig, at fortykkelsen paa dorsalerets dorsale side virkelig afsnører sig til dannelse af gangliet. Figurerne 8—11, pl. XI, viser enkelte stadier fra fortykkelsen, fig. 8, til gangliet er helt afsnøret, fig. 11. Specielt er det aldeles bevisende at røret bagtil er encellet, og at dette encellede rør fortil fortsætter sig i en tydelig fortykkelse fig. 8, samt at røret paa ældre stadier, hvor gangliet er afsnøret, i hele sin udstrækning viser sig encellet. Anlægget til hjertet og pericardiet danner sig efter det af *van Beneden* og *Julin* givne schema ved afsnøring fra epicardiet. Jeg har ikke anstillet nærmere undersøgelser herover.

*Kowalevsky's* tidligere undersøgelser stemmer i flere væsentlige punkter overens med denne fremstilling; specielt

together with the left rudiment of the peribranchial cavity (see Pl. X, fig. 10). The intestine bulges out as in the other groups, and the inner vesicle is divided behind, by a median fusion of the ventral and dorsal walls, into 2 tubes, which, however, are in communication with one another behind. The series of transverse sections, Pl. XI, figs. 2—7, illustrates this stage (Pl. XI, fig. 1). In the middle of fig. 2, which is a section along the line  $\alpha-\beta$  (fig. 1) is the branchial gut  $KD$ , at its sides the right and left rudiments of the peribranchial cavity, and between them, the foremost closed end of the dorsal tube. Fig. 3 (along the line  $\gamma-\delta$ , fig. 1) shows the dorsal tube as an actual tube. Figs. 4 and 5 (along the lines  $\epsilon-\xi$  and  $\eta-\theta$ , fig. 1) show to the right, how the right rudiment of the peribranchial cavity and to the left, how the left rudiment of the peribranchial cavity and the dorsal tube together open out into the branchial gut. It will also be seen in these figures that the branchial gut divides behind into 2 large tubes, the epicardium of the bud. In fig. 6 (along the line  $\iota-z$ , fig. 1) the epicardium is visible as 2 quite separate tubes, which, however, again become one behind fig. 7.

By comparison with the preceding groups, it will be understood how the conditions thus described develop further into the stage represented on Pl. X, fig. 11. The especially characteristic features about this are that the 2 rudiments of the peribranchial cavity coalesce, and that the dorsal tube is much longer, and tapers behind, while it still communicates there with the peribranchial cavity and the branchial gut. The alimentary canal has grown, as also the epicardium in its hinder part.

The stage illustrated on Pl. X, fig. 12 is considerably more advanced. The connection of the peribranchial cavity with the branchial gut is completely broken off, while the dorsal tube is separated behind from the peribranchial cavity. In front, on the other hand, it has become united, as in the other groups, with the branchial gut, and on its foremost dorsal part may be seen a considerable thickening for the formation of the ganglion, while its hinder part is drawn out to a long thin tube, which in transverse section appears single-celled. I have studied the dorsal tube in this stage in numerous sectional series, and it has appeared with decisive certainty that the thickening of the dorsal side of the dorsal tube is really constricted to form the ganglion. Pl. XI, figs. 8—11, show certain stages from the thickening (fig. 8), to the complete constriction of the ganglion (fig. 11). It is quite convincing that the tube behind is single-celled, and that this single-celled tube is continued in front in a distinct thickening (fig. 8), as also that the tube, in more advanced stages, where the ganglion is constricted appears single-celled throughout its length. The rudiment of the heart and pericardium is formed, according to the diagram given by *van Beneden* and *Julin* by constriction from the epicardium. I have made no more detailed investigations on this matter.

*Kowalevsky's* earlier investigations agree in several essential points with this account, especially with regard



gjælder det dannelsen af tarmtraktus og peribranchialsæk. Nervesystemets og dorsالرòrets dannelse bliver imidlertid uforstaaelig efter hans fremstilling.

*Pizon* beskrev dernæst (48 a) knopskydningen hos *Circinalium conrescens* og *Amaroucium* aldeles overensstemmende med den fremsilling jeg ovenfor har givet af de yngre stadier ved figurerne, pl. X, fig. 10 og 11. Han benægter imidlertid bestemt at dorsالرòret siden differentierer sig i ganglion og „hypophysis“. Han mener derimod, at nervesystemet vokser ind i knoppen som en liden fin nerve-streng, „cordon nerveux embryonnaire“. Han siger, pag. 128: „Chez ces deux espèces, pas plus que chez les Péro-phores, le tube qui constitue organe vibratile embryonnaire ne peut être considéré comme un tube neural primitif, ainsi que l'a fait Kowalevsky. Ce prétendu tube neural de Kowalevsky se différencie ultérieurement pour produire l'organe vibratile, qui n'a rien de nerveux, tandis qu'au-dessus de lui se trouve le véritable cordon nerveux embryonnaire.“

Da dette spørgsmaal forekom mig af afgjørende betydning har jeg ligesiden høsten 1892 stadig undersøgt forskellige Ascidieknopper og hos talrige grupper (*Botryllus*, *Botrylloides*, *Glossophorum*, *Distaplia*, *Didemnum* og *Pyrosoma*) overbevist mig om, at gangliet virkelig afsnøres. Jeg maa derfor paa det bestemteste hævde den opfatning, at dorsالرòret virkelig er „det fælles anlæg for ganglion og hypophysis“. I en foreløbig meddelelse til denne afhandling (33) gjorde jeg opmærksom paa, at heller ikke *Pizon* formaaede direkte at paavise den nervetraad der skal vokse ind i knoppen fra moderdyret. Dette væsentlige punkt hviler derfor paa theoretiske opfatninger, og imodsetning hertil staar mit positive fund, at gangliet virkelig snøres sig af fra dorsالرòret.

Min forelobige meddelelse har faaet en bekræftelse af flere forskere, idet *Caullery*, *Ritter* og *Lefèvre* hos forskellige grupper nøiagtig har iagttaget det samme.

Betragter man nu knopskydningen hos de forskellige familier fra et sammenlignende synspunkt, saa forekommer det mig, at der nu foreligger et saa stort materiale, at det maa være tilladt at drage almindeligere slutninger. Det synes fremdeles, at saavel knopanlægget som organudviklingen hos alle grupper frembyder saa store overensstemmelser, at det bliver os muligt i de vigtigste træk iallefald at opstille et almindeligt

### Schema

for organudviklingen hos knopperne.

- 1) Dette schemas første og vigtigste lov er den, at knopanlæggets ydre blære kun leverer knoppens epidermis, medens alle andre organer dannes af den indre blære og af de vandrende mesodermceller.

to the formation of the alimentary canal and the peribranchial cavity. The formation of the nervous system, however, and of the dorsal tube are incomprehensible according to his account.

*Pizon* next described (48 a) budding in *Circinalium conrescens* and *Amaroucium*, in perfect harmony with the account I have given above of the earlier stages on Pl. X, figs. 10 and 11. He positively denies, however, that the dorsal tube is afterwards differentiated into ganglion and „hypophysis“. He thinks, on the other hand, that the nervous system grows into the bud as a small, fine nerve-cord, — „cordon nerveux embryonnaire“. On p. 128, he says: „Ohez ces deux espèces, pas plus que chez les Péro-phores, le tube qui constitue l'organe vibratile embryonnaire ne peut être considéré comme un tube neural primitif ainsi que l'a fait Kowalevsky. Ce prétendu tube neural de Kowalevsky se différencie ultérieurement pour produire l'organe vibratile, qui n'a rien de nerveux, tandis qu'au-dessus de lui se trouve le véritable cordon nerveux embryonnaire.“

As this question appeared to me to be of decisive importance, I have, ever since the autumn of 1892, made frequent examination of various Ascidian buds, and in numerous groups (*Botryllus*, *Botrylloides*, *Glossophorum*, *Distaplia*, *Didemnum* and *Pyrosoma*), convinced myself that the ganglion is actually constricted. I must therefore most positively maintain the theory that the dorsal tube is really the „common rudiment of the ganglion and the hypophysis“. In a statement preliminary to this treatise (33), I drew attention to the fact that *Pizon* was also unable to show directly the nerve fibre which was said to grow into the bud from the parent animal. This essential point rests therefore upon theoretical opinions, and in opposition to it stands my actual discovery, that the ganglion is really constricted from the dorsal tube.

My preliminary statement has received confirmation from several naturalists, *Caullery*, *Ritter* and *Lefèvre* having carefully observed the same thing in different groups.

If budding in the various families be regarded from a comparative point of view, it appears to me that we now have so much material, that we may be permitted to draw general conclusions. It seems moreover that both the bud rudiment and the development of the organs present such great similarity in all the groups, that it will be possible for us, at any rate in the most important features to draw up a general

### Schedule

for the Development of the Organs in the Bud.

- (1) The first and most important law of this schedule is, that the outer vesicle of the bud-rudiment only produces the epidermis of the bud, while all the other organs are formed from the inner vesicle, and from wandering mesoderm cells.

2) Den indre blære danner *gjælletarmen*, *tarmtraktus*, *peribranchialsækken*, *epicardiet*, hvor dette forekommer, antagelig *hjertet* med *pericardiet* og *dorsalrøret*, der igjen differentierer sig i *ganglion* og *hypophysis*.

3) Disse organer dannes alle ved foldningsprocesser. (Udbugtninger, afsnøringer, sammenvoksninger af den oprindelig enkle blæreformige membran):

a) *Peribranchialsækken* anlægges hos grupperne *Perophora*, *Distaplia*, *Clavelina*, *Diplosoma*, *Polyclinum*, som 2 blæreformede udbugtninger en høire og en venstre, af den indre blære, der snart helt afsnøres, hvorved den indre blære deles i 3 blærer. Hos *Pyrosoma* vokser der i stoloen fra entodermrøret (den indre blære) paa hver side ud 1 epitheltap, oprindelig uden lumen, der siden danner anlægget til den ene halvdel af *peribranchialsækken*. Hos alle disse grupper vokser de 2 anlæg siden dorsalt sammen til den sadelformige *peribranchialsæk*.

Hos *Botrylliderne* forløber udviklingen „hurtigere“, idet *peribranchialsækken* med engang bagtil og dorsalt afsnøres af den indre blære som en sadelformig blære.

b) *Tarmtraktus* vokser altid ud som en blindt endende cylinder (hvad *Diplosoma* og *Didemnum* angaar, da se den specielle beskrivelse). Denne cylinder vokser snart hen til cloaken (= *peribranchialsæk*-kens dorsale parti) og munder ud i denne.

c) Som et „dorsalrør“ anlægges det fælles anlæg til nervesystem og *hypophysis*. *Dorsalrøret* vokser hos *Distaplia*, *Perophora*, *Clavelina* (?) ud fra den indre blæres dorsale parti, hos *Didemnum*, *Diplosoma* og *Polyclinum* vokser den ud sammen med det ene anlæg til *peribranchialsækken* fra overgangsstedet mellem *gjælletarm* og *epicardium* paa den indre blære.

Hos *Botryllus* vokser det ud fra det sted af den indre blære, der danner *peribranchialsæk*-kens dorsale parti (cloaken). I alle tilfælde altsaa i sidste instans fra den indre blæres dorsalparti.

Røret vokser overalt ud som en blindt endende cylinder i retningen fortil, det vokser snart sammen med *gjælletarmen* og munder der snart ud i denne, samtidig med at det bagtil afsnøres. Røret differentierer sig dernæst i *ganglion* og *hypophysis*, idet *gangliet* dannes som en fortykkelse af rørets forreste parti, snart dorsalt, snart lateralt, snart ventralt.

d) *Epicardiet* anlægges (*Polyclinum*) af den indre blæres bagre parti, idet dette ved en sammenvoksning af blærens ventrale og dorsale væg deles i 2 rør, der dog forbliver i forbindelse bagtil.

(2) The inner vesicle forms the branchial gut, the alimentary canal, the peribranchial cavity, the epicardium, where that organ occurs, probably the heart and the pericardium, and the dorsal tube, which in its turn is differentiated into the ganglion and the hypophysis.

(3) These organs are all formed by folding processes (evagination, constriction, coalescence of the original simple vesicular membrane).

a) The peribranchial cavity commences in the groups *Perophora*, *Distaplia*, *Clavelina*, *Diplosoma* and *Polyclinum*, as two vesicular evaginations, one right and one left, of the inner vesicle, which are soon completely constricted, whereby the inner vesicle is divided into three. In the stolon of *Pyrosoma*, there grows out on each side of the endodermal tube (the inner vesicle), an epithelial process, originally without a lumen, which subsequently forms the rudiment of one half of the peribranchial cavity. In all these groups, the 2 rudiments afterwards grow together dorsally to form the saddle-shaped peribranchial sac.

In *Botryllidae*, the development proceeds more rapidly, the peribranchial cavity being constricted, behind and dorsally at the same time, from the inner vesicle, as a saddle-shaped vesicle.

b) The alimentary canal always grows out as a caecally ending cylinder (concerning *Diplosoma* and *Didemnum*, see the special description). This cylinder soon grows up to the cloaca (= the peribranchial cavity's dorsal part), and opens into it.

c) The common rudiment of the nervous system and the hypophysis commences as a „dorsal tube“. The dorsal tube in *Distaplia*, *Perophora* and *Clavelina* (?) grows out of the dorsal part of the inner vesicle; in *Didemnum*, *Diplosoma* and *Polyclinum*, it grows out together with the one rudiment of the peribranchial cavity from the place of transition between the branchial gut and the epicardium on the inner vesicle.

In *Botryllus*, it grows out from that place on the inner vesicle which forms the dorsal part of the peribranchial cavity (cloaca), in all cases therefore eventually from the dorsal part of the inner vesicle.

The tube always grows out as a blind-ending cylinder in an anterior direction, and soon coalesces with the branchial gut, into which it then opens, being at the same time constricted behind. The tube is thereupon differentiated into ganglion and hypophysis, the ganglion being formed as a thickening of the front part of the tube, sometimes dorsally, sometimes laterally, sometimes ventrally.

d) The epicardium originates (*Polyclinum*) in the hinder part of the inner vesicle, which by a coalescence of the ventral and dorsal walls of the vesicle, is divided into 2 tubes, which, however, remain connected behind.

- e) Hjertet og pericardiet anlægges hos *Botryllus* som afsnøring af en cellehob af den indre blæres ventrale parti. Hos *Polycliniderne* dannes organerne fra epicardiet, de synes altsaa altid i sidste instants at fremgaa af den indre blære.

Der foreligger imidlertid flere meddelelser om, at organerne dannes af vandrende mesodermceller, og forfatteren vover ikke at udtale sig bestemt om dette spørgsmaal.

- f) Ingestions- og egestionsaabningen dannes ved sammenvoksninger mellem epidermis og den indre blære; gjællespalterne ved lokale sammenvoksninger mellem gjælletarm og peribranchialsækkens viscerele blad. Karakteristisk er for knopskydningen, at gjællespalterne straks anlægges i bestemte rækker.
- 4) Generationsorganer og bindevævsceller vandrer, forskyves ind fra moderdyret. Musklerne dannes alle af vandrende celler.

Angaaende generationsorganerne se under *Botryllide*.

- e) The heart and the pericardium commence in *Botryllus* as a constriction of a mass of cells from the ventral part of the inner vesicle. In *Polyclinidae*, the organs are formed from the epicardium. They therefore seem eventually always to originate in the inner vesicle.

There are however several statements as to the formation of the organs from wandering mesoderm-cells, and the present writer does not venture to give a decided opinion upon this question.

- f) The oral and atrial apertures are formed by the coalescence of the epidermis and the inner vesicle; the branchial stigmata by local coalescences of the branchial sac and the visceral layer of the peribranchial cavity. It is characteristic of budding that the branchial stigmata are in decided rows from the commencement.
- (4) The generative organs and connective tissue cells wander, are pushed in from the parent animal. The muscles are all formed from wandering cells.

Concerning the generative organs, see under the head *Botryllidae*.



# Almindelig Del.

## Kap. 4.

### Sammenligning mellem larve- og knopudviklingen.

Enhver sammenligning mellem larvernes og knoppernes dannelse tager naturlig sit udgangspunkt i de to udviklingsmodis første stadier, anlæg. Det viser sig da umiddelbart, at det befrugtede æg, af hvilket larven dannes, ingen lighedspunkter frembyder med knopanlægget, som vi i kap. 2 skildrede som to concentriske blæreformede epithelmembraner.

Derimod synes ved første betragtning de første larvestadier specielt gastrulastadiet at frembyde stor lighed med det ganske unge knopanlæg. En saadan sammenligning har vel derfor ogsaa, skjønt det kun sjelden er udtalt, foresværet de fleste forfattere, naar de uden nærmere motivering kalder knopanlæggets indre blære „entodermen“ og den ydre blære „ektodermen“. De hosstaaende tekstfigurer 12 og 13 viser to saadanne unge stadier i median-snit, fig. 12 en gastrulalarve, fig. 13 et ungt knopanlæg. Begge er orienterede paa samme maade i forhold til det senere individs længdeakse.



Fig. 12.

Fig. 12 af Korschelt-Heider efter van Beneden og Julin.

*b* = Blastoporus, *ch* = Chordaanlæg, *ec* = Ektoderm, *en* = Entoderm, *n* = Anlægget til centralnervesystemet.

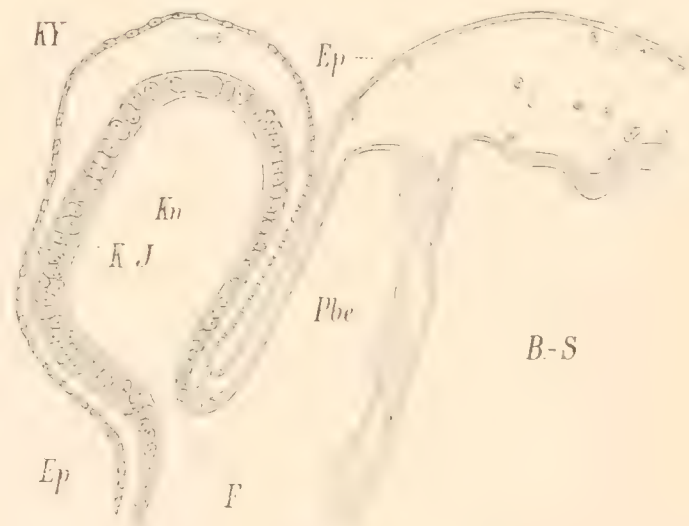


Fig. 13.

Fig. 13 Hjort (31) pl. 37, fig. 9.

*B-s* = Branchialsæk, gjæltarm. *Pbc* = Peribranchialsæk hos moderdyret, *ep* = Epidermis, *F* = Forbindelse mellem moderdyr og knop, *Kn* = Knopanlæg, *K-I* = Indre blære, *K-Y* = ydre blære.

# General Section.

## Chapter IV.

### Comparison between Larval and Bud Development.

Every comparison between the formation of the larva and the bud naturally starts from the earliest stages of the two modes of development, viz. the rudiments. It then immediately appears that the impregnated ovum from which the larva is formed has no points of resemblance to the rudiment of the bud, which we described in chapter II as two concentric, vesicular, epithelial membranes.

It seems, on the other hand, at first sight, as if the earliest larval stages, especially the gastrula stage, show a great resemblance to the very young rudimentary bud. Such a comparison has therefore, though seldom expressed, probably been in the minds of most writers, when they, without further explanation call the rudimentary bud's inner vesicle, „the endoderm“, and its outer vesicle, „the ectoderm“. The accompanying figs. 12 and 13 show two such early stages in median section, — fig. 12, a gastrula larva, fig. 13, a young bud-rudiment. Both are placed in the same way in relation to the long axis of the future animal.

Disse to udviklingsstadier, der begge danner det udgangsstadium, hvorfra organdannelsen begynder, viser utvivlsomt en vis formlighed. De bestaar begge af to epithelblærer, af hvilke i begge tilfælde den ydre danner dyrets epidermis og den indre dyrets tarmløkke.

Ved en grundigere betragtning viser det sig imidlertid, at hermed ogsaa alle lighedspunkter er nævnt.

Undersøger vi nemlig først og fremst, hvorledes de to udviklingsanlæg dannes, saa saa vi i kap. 1, at *gastrulastadiet* fremgaar ved æggets gastrulation, og vi gjenkender i dets to blærer de to primære kimblade, ektodermen og entodermen, medens knop anlægget altid dannes af mere eller mindre udviklede organer hos moderdyret. Knop anlæggets ydre blære viste sig i kap. 2 altid at være en udbugtning af moderdyrets hud, der ikke er identisk med larvens ektoderm, fordi den er sterkt differentieret og forsynet med et tykt celluloselag. Ikke mindre afviger knoppens indre blære fra larvens entoderm. Vi saa i kap. 2, at den indre blære kan anlægges fra forskellige organer, hos *Distaplia* fra tarmløkke,\*) hos *Amaroucium* fra epicardiet, hos *Botryllus* fra peribranchialsækken. End større viser sig forskjellen at blive derved, at peribranchialsækken hos larverne efter de allerfleste forskeres samstemmige resultater anlægges fra ektodermen hos larverne. Heraf drog jeg nemlig den slutning, at knop anlæggets indre blære saaledes oprindeligt fremgaar af larvens ektoderm hos familien *Botryllidae*, og sammenligningen mellem knoppens indre blære og gastrulastadiets entoderm bliver da — ud fra kimbladlærens synspunkter — iallefald for *Botryllidernes* vedkommende en umulighed.

Sammenligner man noiere de to stadiers *bygning*, da findes ogsaa her væsentlige forskjelligheder. Foruden at knop anlæggets ydre blære som ovenfor nævnt er en høit differentieret epidermis med en celluloseschicht, saa er ogsaa den indre blære meget forskjellig fra larvens entoderm. Specielt bliver kontrasten stor hos de familier, der har meget blommerige æg, som f. eks. *Distaplia*, hvor entodermen bestaar af store blommerige celler, medens knoppens indre blære er en liden lavcellet epithelmembran.

De foregaaende kapitler har nu ogsaa givet os materialet til at bevise, at de to udviklingsmodi under senere stadier gennemløber en vidt forskjellig udviklingsproces.

Under *embryonaludviklingen* fandt vi saaledes, at gastrulastadiets ydre blære, den primære ektoderm, hos larven danner følgende organer:

- 1) Epidermis.
- 2) Centralnervesystem, indbefattende larvehjerne, ganglion og hypophysis.
- 3) Peribranchialsæk.

Derimod dannede gastrulastadiets indre blære, „entodermen“ senere:

\*) se note pag. 21.

These two stages of development, which each form the starting-point for the formation of the organs, undoubtedly exhibit a certain similarity of form. They each consist of two epithelial vesicles, the outer one in both cases forming the epidermis, and the inner, the alimentary canal of the animal.

On a closer consideration, it proves, however, that the similarity ends here.

If we first of all enquire into the manner in which the two developmental rudiments are *formed*, we see, as in Chapter I, that the *gastrula stage* is produced by the gastrulation of the ovum, and we recognise in its two vesicles the two primary germ-layers, the ectoderm and the endoderm, while the bud-rudiment is always formed from more or less highly developed organs in the parent-animal. The outer vesicle of the rudimentary bud was proved in Chapter II to be invariably an evagination of the skin of the parent animal, which is not identical with the ectoderm of the larva, because it is highly differentiated, and furnished with a thick layer of cellulose. The inner vesicle of the bud differs in no less a degree from the endoderm of the larva. We saw in chapter II that the inner vesicle can originate in various organs, in *Distaplia*, in the alimentary canal\*); in *Amaroucium*, in the epicardium; in *Botryllus*, in the peribranchial cavity. The difference appears still greater from the peribranchial cavity in the larva, according to the unanimous results of nearly all naturalists, originating in the ectoderm. From this I drew the conclusion that the inner vesicle of the bud-rudiment originally proceeds from the ectoderm of the larva in the family *Botryllidae*, and the comparison between the inner vesicle of the bud and the endoderm of the gastrula stage then becomes, from the germ-layer theory point of view, at any rate as regards *Botryllidae*, an impossibility.

If we compare the structure of the two stages more minutely, essential differences will also be found here. Besides the outer vesicle of the bud rudiment being, as before mentioned, a highly differentiated epidermis with a cellulose layer, the inner vesicle is also very different from the larva's endoderm. The contrast is especially great in those families where the yolk of the ovum is very abundant, as for instance in *Distaplia*, where the endoderm consists of large, abundantly-yolked cells, while the inner vesicle of the bud is a small, low-celled, epithelial membrane.

The foregoing chapters have also given us material to prove that the two ways of development, during later stages, go through very different developmental processes.

Thus, during the *embryonal development*, we found that the outer vesicle of the gastrula stage, „the primary ectoderm“, forms, in the larva, the following organs:

- (1) The epidermis.
- (2) The central organs of the nervous system, including the larval brain, ganglion & hypophysis.
- (3) The peribranchial cavity.

On the other hand, the inner vesicle of the gastrula stage, the endoderm, subsequently forms:

\*) See note, p. 21.

- 1) Tarmtraktus.
- 2) Chorda.
- 3) Mesoderm (muskler, vandreceller, kjønsceller).
- 4) Epicardium.
- 5) Hjerte med pericardium.

Betragter vi nu *knopskydningen*, saa viser det sig, at knopanlæggets ydre blære intet andet danner end

epidermis,

medens den indre blære anlægger:

- 1) Tarmtraktus.
- 2) Epicardium.
- 3) Hjerte med pericardium.
- 4) Peribranchialsæk og
- 5) Centralnervesystem (ganglion og hypophysis).

Fra hvilket synspunkt maa derfor end betragter anlæggene til de to udviklingsmodi, gastrula og knopanlæg, saa kommer vi til det resultat, at de helt og holdent er forskellige dannelser, og er det derfor i høieste grad uheldigt og forvirrende, naar de fleste forfattere uden videre benytter navnene *ektoderm* og *entoderm* om knopanlæggets to blærer. I det følgende vil jeg derfor stadig benytte de indifferente udtryk „indre“ og „ydre blære“, der alene betegner deres forhold i rummet til hinanden, og intet udsiger angaaende deres dannelsesmaade. Samtidig vil jeg da alene benytte begreberne *ektoderm* og *entoderm* om de ved „gastrulationen“ dannede epithelblade hos ægget.

Den ovenfor anstillede sammenligning mellem embryonaludviklingen og knopdannelsen gav os imidlertid ikke alene det resultat, at anlæggene var forskellige, men ogsaa det, at den videre udvikling forløber paa en forskjellig maade.

Af de ovenforstaaende schemaer for organdannelsen ud ifra de to anlæg vil det først og fremst bemærkes, at i det ene schema for knopudviklingen findes ikke alle de samme organer opført som i schemaet for den embryonale udvikling.

Det er jo ogsaa almindelig kjendt at *Ascidielarven* besidder visse „larvale“ organer, der overhovedet ikke kommer til anlæg hos knoppen paa noget stadium, og som larven igjen mister under metamorphosen.

Saadanne organer er

*Halen*

med dens *chorda dorsalis*.

*rudimentære nervestreng,*

*rudimentære entodermstreng og*

*muskulatur.*

*Den larvale hjerne* („Sinnesblase“, „Vésicule cérébrale“).

Ogsaa *mesodermen* kan paa en vis maade henføres hid; thi den kommer ikke til dannelse i knoppen *saaledes* som hos larven, hvor den afspaltes af *entodermen*; men

- (1) The alimentary canal.
- (2) The notochord.
- (3) The mesoderm (muscles, wandering cells, generative cells).
- (4) The epicardium.
- (5) The heart with the pericardium.

When we consider *budding*, it appears that the outer vesicle of the rudimentary bud forms nothing but

The epidermis;

while the inner vesicle forms:

- (1) The alimentary canal.
- (2) The epicardium.
- (3) The heart with the pericardium.
- (4) The peribranchial cavity.
- (5) The central organs of the nervous system (ganglion and hypophysis).

From whatever point, therefore, we regard the rudiments of the two modes of development, the gastrula and the bud-rudiment, we come to the conclusion that they are entirely different formations; and it is therefore extremely unfortunate and confusing, when most writers simply make use of the terms „*ektoderm*“ and „*entoderm*“, with reference to the two vesicles of the rudimentary bud. In the following, I shall therefore employ the neutral expressions „*inner vesicle*“ and „*outer vesicle*“, which only indicate their relations in space to one another, and asserts nothing concerning their manner of formation. At the same time, I shall only make use of the terms „*ektoderm*“ and „*entoderm*“ concerning the epithelial layers formed by the gastrulation of the egg.

The above comparison between the embryonic development, and the formation of the bud brought us not only to the conclusion that the rudiments were different, but also that the further development proceeds in a different manner.

From the above schedules for the formation of the organs from the two rudiments, it will first of all be noticed that the organs in the schedule for the embryonic development, are not all enumerated in the schedule for bud development.

It is also generally known that the *Ascidian larva* possesses certain „larval“ organs which do not originate in the bud in any stage, and which the larva again loses during metamorphosis.

These organs are:

*The tail,*

with its *chorda dorsalis*.

*rudimentary nerve-cord,*

*rudimentary endoderm cord and*

*musculature.*

*the larval brain* (Sinnesblase“, „Vésicule cérébrale“).

The *mesoderm* can also in a certain way be referred to this, for it does not come to formation in the bud in the same way as in the larva, where it is separated from



den føres ind i knoppen fra moderdyret som vandrende bindevævsceller (Se fig. 13).

Dette forhold, at enkelte organer, der forekommer hos larven, ikke anlægges hos knoppen, har ført til, at man har kaldt knopskydningen en *forkortet larveudvikling*. Saaledes siger *van Beneden* og *Julin* (3, pag. 323): „Mais il est incontestable, que l'étude de la larve seule peut fournir des données certaines pour l'interprétation des processus génétiques primitifs: l'évolution du bourgeon est plus directe“. Dette udtrykkes ogsaa almindelig saaledes: knopudviklingen er ikke i den grad som larveudviklingen en rekapitulation af den fylogenetiske udvikling. Vi kommer siden tilbage til dette punkt.

Knopudviklingen lader sig imidlertid ikke helt ud forklare som en „kortere embryonaludvikling“. Ogsaa den maade, hvorpaa organerne dannes, viste sig nemlig efter de specielle kapitler at være væsentlig forskellig hos knop og larve.

Den største interesse ved en saadan sammenligning er knyttet til nervesystemet og peribranchialsækkens dannelse i de 2 udviklingsmodi.

Vi saa, at centralnervesystemet og hypophysis hos larverne fremgik af medullarrøret, en dannelse hvis anlægsmaade er almindelig kjendt paa grund af de store ligheder det viser med centralnervesystemets dannelse hos hvirveldyrene (se forøvrig pl. XII, fig. 1 og 2 samt de i kap. 1 optagne tekstfigurer). Medullarrøret er altsaa en ren ektodermal dannelse, det fremgaar af gastrulastadiets „ydre blære“. Vi saa dernæst ved beskrivelsen af de paa pl. XII afbildede figurer, at medullarrøret under den videre udvikling sondrede sig i den larvale hjerne med dens sandse-organer (tilhoire), det blivende ganglion (dannet ved fortykning af medullarrørets venstre væg) og hypophysen, der repræsenterer medullarrøret i meget rudimentær form, efterat hjerneblæren og ganglion har løst sig fra det. Hvorledes denne sidste udviklingsproces foregaar fremgaar instruktivt af pl. XII. Man ser fig. 3, at medullarrøret fortil ender blindt, fig. 5 og 6 at det er vokset sammen med gjæltarmen (dennes formtarmparti) og fig. 7 at røret kommunikerer med gjæltarmen. Figurerne 6, 7 og 8 demonstrerer endvidere gangliets og hjerneblærens successive udvikling. Ved at sammenholde fig. 7 med fig. 8 forstaar man, hvorledes det blivende centralnervesystem under metamorphosen dannes af det larvale centralnervesystem, idet nemlig hele „larvehjernen“ afsnøres og resorberes.

Væsentlig anderledes var nu centralnervesystemets dannelse hos knopperne. Her dannes det ikke af anlæggets ydre blære men af den indre. Istedetfor at være en indbugtning, som hos larverne, er det en udbugtning af den indre blære. Sammenligningen mellem de forskellige ascidiegrupper viste, at anlægget til centralnervesystemet, som vi her med et indifferent navn kaldte „dorsalrøret“ efter

the endoderm; but it is brought into the bud from the parent animal as wandering connective-tissue cells (see fig. 13).

The circumstance that of certain organs occurring in the larva, there are no rudiments in the bud, has led to budding being called a *shortened larval development*. Thus *van Beneden* and *Julin* (3, p. 323) say: „Mais il est incontestable que l'étude de la larve seule peut fournir des données certaines pour l'interprétation des processus génétiques primitifs: l'évolution du bourgeon est plus directe“. This may generally be expressed: bud development is not, to such an extent as larval development, a recapitulation of the phylogenetic development. We shall return to this point later on.

Bud development does not, however, admit of being interpreted entirely as a shorter embryonic development. The way too, in which the organs are formed appeared, as shown in the special chapters, to be essentially different in bud and larva.

The greatest interest in such a comparison is attached to the formation of the nervous system and the peribranchial cavity in the two modes of development.

We have seen that the central organs of the nervous system, and the hypophysis in the larva proceed from the medullary tube, a formation of which the manner of originating is generally known on account of its great resemblance in some points to the formation of the central organs of the nervous system in vertebrate animals (see also Pl. XII, figs. 1 and 2; and the text-figures in Chapter I). The medullary tube is thus a purely ectodermal formation, proceeding from the outer vesicle of the gastrula stage. We then saw by the description of the figures on Pl. XII, that the medullary tube, during its further development, was divided into the larval brain with its organs of sense (on the right), the permanent ganglion (formed by the thickening of the left wall of the medullary tube) and hypophysis, which represents the medullary tube in a very rudimentary form, after the cerebral vesicle and the ganglion have detached themselves from it. How this last developmental process takes place will be at once seen from Pl. XII. Fig. 3 shows that the medullary tube ends caecally in front; figs. 5 and 6, that it has coalesced with the branchial gut (the fore-gut part); and fig. 7 that the tube communicates with the branchial gut. Figs. 6, 7 and 8 further demonstrate the successive development of the ganglion and the cerebral vesicle. By comparing fig. 7 with fig. 8, it will be understood how the permanent central organs of the nervous system during metamorphosis are formed from the central organs of the nervous system in the larva, the whole of the larval brain being constricted and absorbed.

The formation of the central organs of the nervous system in the bud is essentially different. They are not there formed from the outer, but from the inner vesicle of the rudiment. Instead of being an invagination, as in the larva, they are an evagination of the inner vesicle. Comparison between the various Ascidian groups showed that the rudiment of the central organs of the nervous system,

dets situs, anlægges noget forskjellig hos hver familie; saaledes dannedes det hos *Distaplia* som en median udbugtning af den indre blæres dorsalparti, hos *Amaroucium* anlagdes det sammen med venstre peribranchialsækanlæg, hos *Botryllus* sammen med det hele sadelformige peribranchialsækanlæg (*Pyrosoma*, se den specielle beskrivelse). Disse forskellige mindre afvigelser er dog af liden betydning. Overalt er det væsentlige 1) at centralnervesystemet overhovedet anlægges som et rør, 2) at det indeholder anlægget for det blivende ganglion og hypophysis (men ikke for nogen larvehjerne), 3) at det fremgaar som en udbugtning af den indre blære. Denne udbugtning vokser overalt bagenifra forover først som en blindt endende cylinder, vokser saa sammen med gjællertarmen fortil, afsnøres igjen bagtil og synes saa, idet det snart kommunikerer med gjællertarmen, at danne en bagover rettet udbugtning af denne. Ligesom hos larverne afsnøres gangliet fra en af det rørformige anlægs vægge, og saasåart dette er skeet er dermed ogsaa røret omdannet til hypophysis.

Forskjellighederne i de to udviklingsmodi viser sig derfor væsentlig at bestaa i følgende:

- 1) Udviklingen er mere compliceret („længere“) i larveudviklingen end i knopudviklingen.
- 2) Anlægget tager sin begyndelse fra et andet *sted*, en anden del i knopanlægget end i det embryonale anlæg.

Saa store end afvigelserne nu er hos knopper og larver saa findes der dog ogsaa her lighedspunkter. Jeg fremhæver saaledes:

1) Anlægget til centralnervesystemet er baade i knop og larve rørformigt (medullarrøret, dorsalrøret). 2) Dette anlæg differentierer sig vistnok paa meget enklere maade hos knopperne end hos larverne, idet ikke larvehjernen overhovedet kommer til dannelse, men de dele af centralnervesystemets organer, der er de blivende hos det udvoksede dyr, nemlig det blivende ganglion og hypophysis, de differentierer sig ud fra det rørformige anlæg paa samme maade i knop- og larveudviklingen. 3) Det rørformige anlægs forbindelse med gjællertarmen (flimmergruben) opstaar baade i knop og larve secundært ved sammenvoksning.

Aldeles de samme love finder vi nu for *peribranchialsækken*s dannelse.

Hos larverne saa vi, at peribranchialsækken anlagdes af 2 dorsale indbugtninger af ektodermen. Med sikkerhed fremgik dette af litteraturen og egne undersøgelser for de fleste grupper og *Pizons* afvigende resultater for enkelte andre grupper vedkommende fandt vi iallefald forelobig uantageligt af theoretiske grunde. Hos knopperne forholdt det sig imidlertid paa den maade, at peribranchialsækken overalt dannedes ved udbugtning af den indre blære, hos

which we here called by the neutral name, „dorsal tube“, on account of its position, commences somewhat differently in each family. Thus in *Distaplia*, it is formed as a median evagination of the dorsal part of the inner vesicle; in *Amaroucium*, it commences together with the left rudiment of the peribranchial cavity; in *Botryllus*, together with the whole saddle-shaped rudiment of the peribranchial cavity. (For *Pyrosoma*, see the special description). These various smaller deviations are, however, of little importance. The most important facts in all cases are (1) that the central organs of the nervous system commence as a tube, (2) that they contain the rudiment of the permanent ganglion and hypophysis (but not of any larval brain), (3) that they are formed as an evagination of the inner vesicle. This evagination always grows from behind forwards, at first as a blind-ending cylinder; it then coalesces with the branchial gut in front, is again constricted behind, and then seems, as it soon forms a communication with the branchial gut, to form a backward-directed evagination of the latter. As in the larva, the ganglion is constricted from one of the walls of the tubular rudiment, and when this has taken place, the tube is thereby converted into the hypophysis.

The differences between the two modes of development prove therefore to be as follow:

- (1) The development is more complicated („longer“) in the larval than in the bud development.
- (2) The rudiment starts from another *place*, from two different parts in the bud-rudiment and in the embryonal rudiment.

Great as are the differences between buds and larvæ, there are points of resemblance to be found here too. Of these may be mentioned:

(1) The rudiment of the central organs of the nervous system is tubular both in the bud and in the larva (the dorsal tube, the medullary tube). (2) This rudiment is, it is true, differentiated in a far simpler manner in the bud than in the larva, the larval brain generally not coming to formation; but those parts of the central organs of the nervous system that are permanent in the full-grown animal, — the permanent ganglion and hypophysis, — are differentiated from the tubular rudiment in the same manner in both bud and larval development. (3) The connection of the tubular rudiment with the branchial gut (dorsal tubercle) arises both in bud and larva secondarily by coalescence.

We now find exactly the same laws for the formation of the *peribranchial cavity*.

We saw that in the larva, the peribranchial cavity originated in 2 dorsal invaginations of the ectoderm. This appeared with certainty from the literature, and from my own personal investigations with regard to the greater number of groups; while *Pizon's* different results we found, for the present at any rate, to be inadmissible on theoretical grounds. In the buds, however, it appeared that the peribranchial cavity was always formed by evagination of



de fleste grupper som 2 udbugtninger, hos *Botryllus* som en enkelt udbugtning.

Vi finder her igjen den samme grundforskjel: hos larven dannes et organ af ektodermen, hos knoppen af den indre blære. Organets videre udvikling frembyder imidlertid store lighedspunkter; de 2 anlæg smelter sammen til en enkelt blære, der saa sadelformig breder sig ud over gjælletarmen. I mit tidligere arbejde har jeg betegnet det som en afkortning i udviklingen hos *Botryllide*-knopperne at peribranchialblæren straks anlægges som en enkelt blære og ikke af 2, der siden smelter sammen. Som en saadan afkortning kan det ogsaa betragtes, at medens gjællespalterne i larveudviklingen anlægges paa en kompliceret maade, først 2 der videre deler sig (se *Willeys* udmerkede undersøgelser [66]), optræder gjællespalterne i knopudviklingen fra første øieblik i rækker.

Ogsaa *tarmlæret* viser et andet forhold i knop- og larveudviklingen. Hos larverne findes der rudimentære anlæg (halens rudimentære entodermstreng), og rectum betragtes af *van Beneden* og *Julin* som en nydannelse. Hos knopperne vokser hele *tarmlæret* ud som en liden blindt endende cylinder fra den indre blære af.

Hjertet med pericardiet og epicardiet synes i alt væsentligt at dannes paa lignende maade hos knopperne og larverne, idet begge organer udgaar fra gjælletarmen (hos knopperne = den midtre af de 3 blærer, hvori den indre deles).

Vor betragtning af knopudviklingen hos *Ascidierne* fører os da til at opstille følgende love:

- 1) Knopudviklingen viser sig i mange henseender som en forkortet udviklingsproces. Halen (med chorda, muskulatur, rudimentær entodermstreng), hjerneblæren (med sandseorganer) anlægges ikke. Gjællespalterne anlægges paa enklere maade.
- 2) De øvrige organer anlægges ud fra et anlæg der saavel fra et morfologisk som et histologisk synspunkt er saaledes bygget, at det ikke svarer til noget af de embryonale stadier.
- 3) Organudviklingen ud fra dette anlæg foregaar efter en væsentlig anden grundplan end i den embryonale udvikling.

*Kowalevsky* undlader i sine arbejder helt at trække saadan sammenligning mellem de 2 udviklingsmodi, hvad dengang ogsaa vilde være forbundet med store vanskeligheder, skjønt hans egne undersøgelser helt fører i den samme retning, som min fremstilling.

*Seeliger* var derfor den første, som udviklede et synspunkt i lighed med det ovenfor fremstillede for knopudviklingen, skjønt de facta, hvorpaa han bygger sin opfatning i væsentlige punkter har maattet modificeres. Han siger saaledes (57, pag. 45): „Für's Erste zeigt sich die Entwicklung durch Knospung als eine viel directere, bei welcher gerade die Stadien fehlen, auf welche die Wirbelthier ver-

the inner vesicle, in most groups as 2 evaginations, in *Botryllus* as a single evagination.

We here find again the same fundamental difference: in the larva an organ is formed from the ectoderm, in the bud from the inner vesicle. The further development of the organ presents, however, points of great resemblance: the 2 rudiments merge into a single vesicle, which then extends in a saddle shape over the branchial gut. In my earlier paper, I have designated as a curtailment of the development of the *Botryllide* buds, the originating of the peribranchial cavity at once as a single vesicle, and not as two, which subsequently merge into one. As such a curtailment may also be regarded the circumstance, that while the branchial stigmata in the larval development commence in a complicated manner, first 2, which go on dividing (see *Willey's* excellent investigations [66]), the branchial stigmata in the bud development appear in rows from the very first.

The *alimentary canal* also presents different conditions in the bud to those in the larval development. In the larva there are rudiments (the rudimentary endodermal cord of the tail), and the rectum is considered by *van Beneden* and *Julin* to be a new formation. In the bud, the whole alimentary canal grows out like a small caecal cylinder right from the inner vesicle.

The *heart* with the *pericardium*, and the *epicardium* seem, in all essential points, to be formed in a similar manner in buds and larvæ, both organs issuing from the branchial gut (in the bud = the middle of the 3 vesicles into which the inner vesicle is divided).

Our consideration of bud development in *Ascidie* leads us to establish the following laws:

- (1) Bud-development appears in many respects to be an abbreviated developmental process. The tail (with the notochord, the musculature and the rudimentary endodermal cord) and the cerebral vesicle (with the organs of sense) have no rudiment. The branchial stigmata commence in a simpler manner.
- (2) The other organs originate in a rudiment which, from a morphological as well as a histological point of view, is so constructed that it does not correspond to any of the embryonal stages.
- (3) The development of the organs from this rudiment proceeds according to an essentially different fundamental plan to that in the embryonic development.

*Kowalevsky* entirely omits in his writings to draw comparisons like these between the two modes of development. At that time, it would have been connected with great difficulty, although his investigations lead entirely in the same direction as my statement.

*Seeliger* was therefore the first to propound a view of bud-development similar to the above, although the facts on which he has built his theory have necessarily been modified in some points. He says (57, p. 45): „Für's Erste zeigt sich die Entwicklung durch Knospung als eine viel directere, bei welcher gerade die Stadien fehlen, auf welche die Wirbelthierverwandtschaft begründet wurde“.



wandschaft begründet wurde.“ Fremdeles: „Es ist oben bereits angedeutet worden, dass wir im Verlaufe der Knospung kein Stadium finden, welches der Gastrula in der Embryonalentwicklung gleich zu setzen wäre. Eine äussere Aehnlichkeit zwischen Gastrula und der zweischichtigen Knospenanlage besteht allerdings aber nur eine ganz äusserliche.“ Hans paavisning af, at knopanlæggets ydre blære ikke er lig gastrulastadiets ektoderm, var ogsaa et betydeligt fremskridt. I et senere arbejde, i hvilket han bekræfter mine undersøgelser over knopudviklingen indtager han et endnu mere overensstemmende standpunkt og jeg vil derfor ikke berøre de spørgsmål, hvori hans tidligere arbejde væsentlig differerer fra mit. Pag. 389 siger han (60): „Ein vollständiger Parallismus der Organentwicklung in Knospen und Embryonen besteht nicht und hat auch phylogenetisch niemals bestanden.“ Denne forskjel mellem larve- og knopudvikling forklarer *Seeliger* saaledes: „Schon beim ersten phylogenetischen Auftreten der Knospung bei den Ascidien könnte das ektodermale Hautepithel der Stammform, welches zum Ektoderm der Knospe wird, einen so ausgeprägten Grad der histologischen Differenzierung besessen haben, dass eine Rückkehr auf ein mehr embryonales Stadium, wie es die Bildung der Peribranchialbläschen verlangt, unmöglich war. Die ungeschlechtliche Vermehrung wurde nur dadurch möglich, dass ein anderes Keimblatt und zwar das Entoderm in dem in die Knospe übertretenden Abschnitte embryonales Material, wenn ich so sagen darf, erhalten zeigte, welches sich zur Bildung auch solcher Organe geeignet und fähig erwies, die im Embryo ektodermal entstehen.“

Da *Seeliger*s udviklingsmekaniske opfatning af kimbladene ikke er mig bekendt, ved jeg ikke, i hvilken udstrækning hans opfatning er identisk med min; i grundtrækkene turde vor opfatning maaske være den samme.

Der gives imidlertid et forhold, som bringer mig til at tro, at *Seeliger* dog maaske tænker sig knopudviklingen som en modificeret embryonaludvikling. Han kalder saaledes altid knopanlæggets indre blære „entodermen“, og man faar indtrykket af, at han tænker sig at der blandt denne „entoderms“ celler findes bevaret nogle ektodermceller, der formaar at danne f. eks. nervesystem. Saaledes siger han ogsaa (60, pag. 390): „In den Knospen der Ascidien spielt das primäre Nervenrohr, das vom Entoderm sich bildet, die gleiche Rolle, wie das vom Mesoderm entstandene primäre Nervenrohr in den Pyrosomaknospen.“

Det er mig, som anført, ubekendt paa hvilken udviklingsmekanisk opfatning dette beror. Under enhver omstændighed finder jeg det imidlertid meget misvisende i sin almindelighed at kalde knoppens indre blære eller de organer, der dannes af den, entodermale. For det første saa vi nemlig ovenfor, at den indre blære hos *Botryllus*-knopperne anlægges fra et ektodermalt organ og for det andet, og dette synspunkt er for mig det overveiende væsentlige, kan knopanlægget i det hele, saasandt det optræder som knopanlæg, overhovedet ikke sammenlignes med larvens kimblade. I mit tidligere arbejde har jeg udtrykt dette saale-

And again: „Es ist oben bereits angedeutet worden, dass wir im Verlaufe der Knospung, kein Stadium finden, welches der Gastrula in der Embryonalentwicklung gleich zu setzen wäre. Eine äussere Aehnlichkeit zwischen Gastrula und der zweischichtigen Knospenanlage besteht allerdings aber nur eine ganz äusserliche.“ His pointing out that the outer vesicle of the rudimentary bud is not like the ectoderm of the gastrula stage, was also a considerable step in advance. In a later work, in which he confirms my investigations on bud-development, he takes up a position even more in conformity with mine, and I will not therefore touch on the questions in which his earlier work differed essentially from mine. On p. 389 (60), he says: „Ein vollständiger Parallismus der Organentwicklung in Knospen und Embryonen besteht nicht, und hat auch phylogenetisch niemals bestanden.“ This difference between larval and bud development, *Seeliger* explains as follows: „Schon beim ersten phylogenetischen Auftreten der Knospung bei den Ascidien könnte das ektodermale Hautepithel der Stammform, welches zum Ektoderm der Knospe wird, einen so ausgeprägten Grad der histologischen Differenzierung besessen haben, dass eine Rückkehr auf ein mehr embryonales Stadium, wie es die Bildung der Peribranchialbläschen verlangt, unmöglich war. Die ungeschlechtliche Vermehrung wurde nur dadurch möglich, dass ein anderes Keimblatt und zwar das Entoderm in dem in die Knospe übertretenden Abschnitte embryonales Material, wenn ich so sagen darf, erhalten zeigte, welches sich zur Bildung auch solcher Organe geeignet und fähig erwies die im Embryo ektodermal entstehen.“

As I am not acquainted with *Seeliger*'s developmental-mechanical theory of germ layers, I do not know to what extent it is identical with mine; in its fundamental features, our views may perhaps be similar.

There is, however, one circumstance which leads me to believe that perhaps *Seeliger* considers bud development as a modified embryonic development. For instance, he always calls the inner vesicle of the bud-rudiment the „endoderm“, and one has an impression that he imagines that among the cells of this „endoderm“, a few ectoderm cells are preserved, which are capable, for instance, of forming the nervous system. Thus he says (60, p. 390): „In den Knospen der Ascidien spielt das primäre Nervenrohr, das vom Entoderm sich bildet, die gleiche Rolle, wie das vom Mesoderm entstandene primäre Nervenrohr in den Pyrosomaknospen.“

As already stated, I do not know upon what developmental-mechanical theory this is founded. Under any circumstances, however, I consider it very misleading in general to call the bud's inner vesicle or the organs formed from it, endodermal. In the first place, we have seen that the inner vesicle in *Botryllus* buds is formed from an ectodermal organ; and in the second place, — and this point seems to me the mainly essential one — the rudimentary bud, as a whole, as soon as it appears as a rudimentary bud, cannot be compared generally with the germ-layers of the larva. In my former paper I have expressed this

des: „Allein das Faktum, dass dieselbe innere Blase, die nur aus einem Keimblatt der Larve herstammt so verschiedene Organe, wie den Darm und das Nervensystem bilden kann, scheint genügend zu zeigen, dass ihr Keimblatt nicht als Keimblatt im gewöhnlichen Sinne aufzufassen ist.“

Det hele knopanlæg maa derfor tænkes væsensforskjelligt fra ethvert stadium af embryonaludviklingen og den indre blære består af celler, der er kvalitativt indifferente som det æg, hvorfra de i sidste instants dannes.

Til samme opfatning har *Ritter* og *Caulley* sluttet sig, medens *Salensky*, *Pizon* og *Garstang* har søgt at opretholde den opfatning, at knopudviklingen dog lader sig føre tilbage til den embryonale udviklings principer. Da de resultater, hvorpaa disse sidste forskere støtter sin opfatning, punkt for punkt er behandlede dels i den foregaaende afhandling, dels i dette arbeides specielle del, forbigaar jeg det her.

Jeg vil kun kort berøre knopskydningen andetsteds i dyreriget. Det vil være almindelig bekjendt, at de fleste tidligere undersøgere overalt i dyreriget har søgt at føre knopskydningen tilbage til en art delingsproces, der ifølge den *v. Kennel-Langske* knopskydningsteori oprindelig har været fremkaldt ved ydre skadelige angreb, men efterhaanden er gaaet over til en normal proces. De dele, hvori „moderdyret“ deles, tænkes da at danne nye individer ved regeneration. Da man nu fremdeles har ment, at al regeneration i dyreriget har den tendens at recapitulere den embryonale udvikling og danne nye organer af lige organer eller af lige organers kimblad, saa har man ved overordentlig indgaaende undersøgelser søgt at finde en overensstemmelse mellem knopskydning og larveudvikling. En saadan overensstemmelse har ogsaa i de fleste tilfælde vist sig at være tilstede. Hos *Anneliderne* regenereres de nye organer efter de fleste forfattere ud fra de gamle, hos *Hydroiderne* bugter begge kimblade sig ud til dannelse af knoppen.

Imidlertid foreligger der dog ogsaa afvigende meddelelse. Foruden hvad jeg har meddelt her hos *Ascidierne* meddeler *Braem*, at knopskydningen hos *Bryozoen* alene udgaar fra ektodermen (5) og *Chun* har synlig paavist at hele knopanlægget hos visse meduser, *Margelider*, er af ren ektodermal oprindelse (11).

Det siger sig selv, at knopskydningen ogsaa i dette tilfælde kan opfattes som en regeneration. Kun maa man da tænke sig at knopskydningen udgaar fra et mere primitivt anlæg, i hvilket moderdyrets organisationsplan ikke saaledes fra første stadium af kan paavises, som i de tilfælde, hvor knopskydningen virkelig er en deling (*Turbellarier*, *Annelider*), eller hvor knopanlægget dannes ved udbugtning af begge moderdyrets kropsmembraner, kimblade (*Hydroiderne*).

*Knopskydningen er her virkelig udvikling ikke alene regeneration.*

Den norske Nordhavsexpedition. Johan Hjort: Kimbladstudier paa grundlag af *Ascidierne*s udvikling.

as follows: „Allein das Faktum dass dieselbe innere Blase, die nur aus einem Keimblatt der Larve herstammt so verschiedene Organe wie den Darm und das Nervensystem bilden kann, scheint genügend zu zeigen, dass ihr Keimblatt nicht als Keimblatt im gewöhnlichen Sinne aufzufassen ist.“

The whole rudimentary bud in its nature must therefore be considered as essentially different from any stage of embryonic development, and the inner vesicle consists of cells that are qualitatively indifferent like the ovum from which they are ultimately formed.

*Ritter* and *Caulley* have subscribed to the same view, while *Salensky*, *Pizon* and *Garstang* have tried to maintain the theory that the bud-development does admit of being traced back to the principles of embryonic development. As the results with which these latter writers support their view is discussed point by point partly in the foregoing paper, partly in the special section of this paper, I will pass them by here.

I will only briefly touch upon the subject of budding elsewhere in the animal kingdom. It will be generally known that most of the earlier investigators of all parts of the animal kingdom have attempted to trace budding back to a kind of dividing process, which, according to the *v. Kennel-Lang* theory of budding, has originally been occasioned by external injury, but by degrees has passed into a normal process. The parts into which the parent animal is divided, are then supposed to form new individuals by regeneration. As it is still thought that all regeneration in the animal kingdom has a tendency to recapitulate the embryonic development, and form new organs from similar organs, or from the germ-layers of similar organs, endeavours have been made by exceedingly minute investigations to establish a harmony between budding and larval development. Such a harmony has indeed in most cases been proved to exist. In the *Annelids*, the new organs are regenerated, according to most writers from the old ones. In *Hydroids*, both the germ-layers bulge out to form the bud.

There are, however, also varying statements. Besides what I have stated here of *Ascidiae*, *Braem* states (5) that in *Bryozoa*, budding proceeds only from the ectoderm, and *Chun* has recently demonstrated (11) that the entire rudiment in certain medusæ — *Margelide* — is of purely ectodermal origin.

It is self-evident that budding in this instance too, may be regarded as a regeneration; but then it must be considered that budding arises from a more primitive rudiment, in which the parent-animal's plan of organisation cannot be thus demonstrated from the earliest stage onward, as in the cases where budding is really a division (*Turbellarians*, *Annelids*), or where the rudimentary bud is formed by an evagination of both the body-membranes of the parent animal, germ-layers (*Hydroids*).

*Budding is here actual development not simply regeneration.*



Der reiser sig imidlertid da de spørgsmaal: Hvorledes forholder sig en knopskydning ud fra et saa primitivt anlæg til kimbladlæren, og hvorledes stemmer saa den senere knopskydnings forløb med læren om rekapitulation i udviklingen, med den fylogenetiske grundlov. I de følgende kapitler vil jeg i al korthed redegjøre for, hvad de her vundne resultater synes at vise i denne retning.

## Kapitel 5.

### Ascidiernes knopskydning og kimbladlæren.

Den første kimbladlære var den erfaringsmæssige vundne erkjendelse, at dannelsen af et bestemt organ overalt i dyreriget eller iallefald inden større grupper sker ud fra det samme „primære kimblad“; saaledes fandt man, at centralnervesystemet altid dannedes af ektodermen. Med „primære kimblade“ har da utvivlsomt de fleste zoologer forstaaet de bladformige epithelmembraner, der tidlig i udviklingen dannes ved den som gastrulation beskrevne udviklingsproces.

I de fleste grupper i dyreriget har man kunnet beskrive et tobladet „gastrulastadium“, og om dette end i de forskellige grupper har vist sig at fremvise forskelligheder, saa har man dog ment, at gastrulationen overalt var en saa tilsvarende proces, at den overalt maatte antages at betegne en bestemt udviklingsepoche. Saaledes siger brødrene *Hertwig* (26, pag. 2): „Entwicklungsgeschichtliche Forschungen, welche im Anschluss an die Gastraeatheorie die übrigen Stadien der Thierentwicklung auf demselben Wege erklären wollen, werden naturgemäss von der Frage auszugehen haben, in welcher Weise entwickelt sich der zweiblättrige Keim zu höherer Organisation.“ Dette, at følge de to gastrulablades senere skjæbne under udviklingen og specielt at undersøge, hvilke organer hvert blad danner har utvivlsomt været det morphologiske problem, som de fleste zoologer har opfattet som det egentlige udviklingshistoriske kimbladspørgsmaal. I de store hovedtræk kan man ogsaa sige, at svaret har været det, at de samme, „ligeværdige“ organer som f. eks. centralnervesystemet overalt dannes paa en meget overensstemmende maade fra kimbladene. Man vil derfor utvivlsomt til alle tider erkjende, at der med kimbladlæren har været udtalt en vigtig lovmæssighed, og at denne lære i hoi grad har ført embryologien fremad.

Der har dog helt siden *Balfours* tid reist sig mange indvendinger mod kimbladlæren. Man har hævdet, at denne ikke gjælder med nogen absolut lovmæssighed. Saaledes har nogle forskere paavist, at gastrulastadiet ikke overalt

The following questions, however, will arise: In what relation does budding from so primitive a rudiment stand to the germ-layer theory; and how does the subsequent progress of budding harmonise with the theory of recapitulation in the development, — with the phylogenetic fundamental law? In the following chapters, I will briefly state what the results here arrived at seem to prove in that direction.

## Chapter V.

### Gemmation in Ascidians and the Germ-layer Theory.

The earliest germ-layer theory was the empirically gained acknowledgement that the formation of a certain organ everywhere in the animal kingdom, or at any rate within the larger groups, originates in the same „primary germ-layer.“ The central organs of the nervous system were thus considered to be always formed from the ectoderm. By „primary germ-layer“, most zoologists have undoubtedly understood the laminar, epithelial membranes, which are formed early in the development, by the process described as gastrulation.

In most groups of the animal kingdom, it has been possible to describe a bi-laminar „gastrula stage“; and even if this has proved to exhibit differences in the various groups, it has still been thought that gastrulation was a so universally similar process, that it might always be assumed to indicate a certain developmental epoch. The brothers *Hertwig* write as follows (26, p. 2): „Entwicklungsgeschichtliche Forschungen, welche im Anschluss an die Gastraeatheorie die übrigen Stadien der Thierentwicklung auf demselben Wege erklären wollen, werden naturgemäss von der Frage auszugehen haben, in welcher Weise entwickelt sich der zweiblättrige Keim zu höherer Organisation.“ To follow the subsequent fate of the gastrula layers during development, and in particular to investigate the question as to which organs each layer forms, has undoubtedly been the morphological problem which most zoologists have regarded as the true developmental-historical germ-layer question. In its main features too, it may be said that the answer has been, that the same equally important organs as, for instance, the central organs of the nervous system, are formed everywhere in a very similar manner from the germ-layers. It will therefore undoubtedly always be acknowledged that in the germ-layer theory an important conformity to law has been stated, and that this theory has, in a very great measure, contributed to the advance of embryology.

Ever since *Balfour's* time, however, objections have been raised to the germ-layer theory. It has been asserted that it is not applicable with any absolute conformity to law. For instance, some naturalists have demonstrated



i dyreriget er en identisk dannelse, idet det selv dannes paa en forskjellig maade. Jeg henviser her til *E. B. Wilson's* prægtige afhandling: „The cell-lineage of Nereis“ (68) hvor han, pag. 367, preciserer et saadant standpunkt: „It appears to me, that the only course open to embryological investigation is to examine more precisely the origin of the gastrula itself; to take as a starting-point not the two-layered gastrula but the ovum. The „gastrula“ cannot be taken as a starting-point for the investigation of comparative organogeny unless we are certain that the two layers are everywhere homologous. Simply to assume this homology is simply to beg the question. The relationship of the inner and outer layers in the various forms of gastrulas must be investigated not only by determining their relationship to the adult body, but also by tracing out the cell-lineage or cytogeny of the individual blastomeres from the beginning of development.“

Paa den anden side har der hævet sig stemmer, der har hævdet, at der gives tilfælde, i hvilke organerne dannes anderledes end almindeligt. Saaledes har *Heymons* (30) paavist, at hele tarmtractus hos visse insekter dannes af ektodermen, et tilfælde, som han har havt den venlighed at demonstrere for mig med de mest overbevisende præparater. Fremdeles har man anført mod kimbladlæren (i den betydning vi hidtil har brugt dette ord), at organerne i knopudviklingen ofte anlægges paa anden maade end ellers (saaledes hos *Ascidier*, *Bryozoa*, visse *Meduser*).

Disse stridsspørgsmaal har nu ført *Braem* (7) til at fremsætte den thesis, at kimbladene som de sædvanlig forstaaes ikke er brugelige for embryologisk forskning. Istedetfor at man, som hidtil, definerer ordet endoderm med udtrykket „gastrulalarvens indre blad“, mener *Braem*, at man maa opfatte kimbladene fra et fysiologisk synspunkt. Pag. 42 udtrykker forfatteren dette saaledes (7): „Wir sehen also, dass die Gastracatheorie am Ende nichts weiter besagt, als was von Anfang an feststand, dass nämlich die Keimblätter gleichbedeutend, d. i. *analog* seien; wenn *Haeckel* dafür das Wort „homolog“ setzt, ein Ausdruck, der sonst die Gleichheit der *Lage* zu bezeichnen pflegte, so ist das eine Sache für sich, es ist nur ein Sprachgebrauch.“ Til denne opfatning synes specielt studiet af de afvigende forhold hos knopperne at have ført forfatteren.

Det forekommer mig, at den morfologiske og fysiologiske betragtning af udviklingen ikke er to synspunkter, der udelukker hinanden, men tvertimod supplerer og støtter hinanden og begge er nødvendige for en biologisk forstaaelse. En morfologisk betragtning af udviklingen maa have til maal at studere de formdannelser og formforandringer, en organisme gennemløber fra ægget og til det voksne individ og at sammenligne de forskjellige typer med hinanden. Brødrene *Hertwig* giver denne tanke følgende klare form (26, pag. 1): „Wenn die vergleichende Entwicklungsgeschichte das reichliche aus zahllosen Einzeluntersuchungen ihr zuströmende Material wissenschaftlich verwerthen soll,

that the gastrula stage is not an identical formation throughout the animal kingdom, it being itself formed in a different way. I would here refer to *E. B. Wilson's* excellent treatise, the „Cell-lineage of Nereis“ (68), in which (p. 367) he precisely defines such a stand-point: „It appears to me, that the only course open to embryological investigation is to examine more precisely the origin of the gastrula itself; to take as a starting-point, not the two-layered gastrula, but the ovum. The „gastrula“ cannot be taken as a starting-point for the investigation of comparative organogeny, unless we are certain that the two layers are everywhere homologous. Simply to assume this homology is simply to beg the question. The relationship of the inner and outer layers in the various forms of gastrulas, must be investigated, not only by determining their relationship to the adult body, but also by tracing out the cell-lineage, or cytogeny, of the individual blastomeres from the beginning of development.“

On the other hand, voices have been raised, asserting that there are cases in which the organs are formed otherwise than in the ordinary way. Thus *Heymons* (30) has shown that the whole alimentary canal in certain insects is formed from the ectoderm, a circumstance which he has been kind enough to demonstrate to me by means of the most convincing preparations. Furthermore, it has been quoted against the germ-layer theory (in the sense in which we have hitherto used the word), that in the bud development the organs often commence in an unusual way (e. g. in *Ascidia*, *Bryozoa* and certain *Medusæ*).

These debated points have led *Braem* (7) to put forward the thesis, that the germ-layers in their ordinary acceptance, are of no use in embryological research. Instead of, as hitherto, defining the word endoderm by the expression „the inner vesicle of the gastrula larva“, *Braem* thinks that the germ-layers ought to be regarded from a physiological point of view. On p. 42 (7) the author thus expresses this: „Wir sehen also, dass die Gastracatheorie am Ende nichts weiter besagt, als was von Anfang an feststand, dass nämlich die Keimblätter gleichbedeutend, d. i. *analog* seien; wenn *Haeckel* dafür das Wort „homolog“ setzt, ein Ausdruck, der sonst die Gleichheit der *Lage* zu bezeichnen pflegte, so ist das eine Sache für sich, es ist nur ein Sprachgebrauch.“ The study of the differing conditions in the buds, seems especially to have led the author to take this view.

It appears to me that the morphological and the physiological considerations of the development are not two points of view which exclude one another, but on the contrary, they supplement and support one another, and are both necessary to a biological comprehension. The aim of a morphological consideration of the development must be to study the formation and changes of form through which an organism may pass, from the ovum to the full-grown animal, and to compare the various types with one another. The brothers *Hertwig* give this thought the following clear expression (26, p. 1): „Wenn die vergleichende Entwicklungsgeschichte das reichliche aus zahllosen Einzelunter-

so muss sie einer doppelten Aufgabe genügen. Wie ihre Schwesterwissenschaft die vergleichende Anatomie für die ausgebildeten Thiere, so hat sie für die Keime die morphologische gleichwerthigen Theile festzustellen, in dem sie ihre gegenseitigen Lagebeziehungen und die Art ihres Zusammenhanges untersucht, und hat aus den so gewonnenen Erfahrungen über das verwandtschaftliche Verhältniss der Thierformen Klarheit zu verbreiten.

Zweitens hat die vergleichende Entwicklungsgeschichte aber auch die Prozesse der Entwicklung zum Gegenstand ihrer Beurtheilung zu machen; sie soll uns in das Wesen dieser Prozesse einen Einblick gewähren und uns verstehen lehren, wie es kommt, dass die Eizelle sich zum Zellenhaufen, der Zellenhaufen sich zum zweischichtigen Keim u. s. w. verwandelt.“

Her er klart og tydelig betegnet hvad der er den *morphologiske* udviklingshistorie opgave; den består i at beskrive, sammenligne udviklingens former og om muligt at søge at forklare dem i forhold til hinanden. Om nu ogsaa den morphologiske udviklingshistorie benytter fysiologiske synspunkter forekommer det mig ikke som *Braem* mener, at være nogen grund til at opgive den morphologiske opgave. Man maa selvfølgelig være forsigtig, naar man i en morphologisk undersøgelse stotter sig til fysiologiske synspunkter (f. eks. ved undersøgelsen af et organs saakaldte „homologi“) og være sig bevidst, at man let kan tage fejl.

Selv om det imidlertid ved de mest indgaaende undersøgelser skulde vise sig, at gastrulastadiet ikke overalt i dyreriget er en tilsvarende dannelse, og at organerne i mange tilfælde dannes paa forskjellig maade ud fra gastrulaen, saa maa derfor ikke den morphologiske videnskab opgive sin *methode*: at studere udviklingens formstadier, den maa derimod søge at finde ud, i hvilken *grad* overensstemmelser findes og, om muligt, søge aarsagerne til afvigelserne. Viser det sig under dette arbejde, at der ikke findes en bestemt udviklingsplan for *alle* typer, saa man kan undersøge hver type for sig, og søge at finde, hvori typerne skiller sig fra hinanden.

Da nu Ascidiendviklingen har et yderst karakteristisk udviklingsstadium, i hvilket embryoet består af 2 blade saa har jeg tidligere, som jeg troede i overensstemmelse med den almindelige udviklingshistoriske opfatning, hævdet at: „Die Definition des Entoderms ist ja nicht „Alles was Darm bildet“, sondern das embryonale innere Blatt, das bei der Gastrulation des Eies entsteht“. Jeg mener frendes, at hvis man ikke vil tilstede denne definition, men f. eks. bruge definitionen „Alles was Darm bildet“ paa begrebet entoderm, saa bliver for det første da entoderm noget ganske andet end det vi nu forstaar derved, (paa gastrulastadiet en meget mindre cellegruppe end vor entoderm, der ogsaa omfatter chorda, mesoderm o. s. v.) for det andet maatte da den morphologiske videnskab finde paa et nyt ord for begrebet „gastrulararens indre blad“, et begreb uden hvilket det vil blive dobbelt vanskeligt at beskrive

suchungen ihr zuströmende Material wissenschaftlich verwerthen soll, so muss sie einer doppelten Aufgabe genügen. Wie ihre Schwesterwissenschaft die vergleichende Anatomie für die ausgebildeten Thiere, so hat sie für die Keime die morphologisch gleichwerthigen Theile festzustellen, indem sie ihre gegenseitigen Lagebeziehungen und die Art ihres Zusammenhanges untersucht, und hat aus den so gewonnenen Erfahrungen über das verwandtschaftliche Verhältniss der Thierformen Klarheit zu verbreiten.

Zweitens hat die vergleichende Entwicklungsgeschichte aber auch die Prozesse der Entwicklung zum Gegenstand ihrer Beurtheilung zu machen; sie soll uns in das Wesen dieser Prozesse einen Einblick gewähren und uns verstehen lehren, wie es kommt, dass die Eizelle sich zum Zellenhaufen, der Zellenhaufen sich zum zweischichtigen Keim, u. s. w. verwandelt.“

This clearly indicates what is the object of the *morphological* developmental history; it consists in describing and comparing the forms of development, and if possible trying to explain them in their relation to one another. That the morphological developmental history makes use of physiological points of view, does not appear to me, as *Braem* thinks it to be, a reason for abandoning the morphological question. Caution is of course required in relying on physiological points of view in a morphological investigation (e. g. in the investigation of the so-called „homology“ of an organ), and a consciousness of how easily one may be mistaken.

Even if, however, after the most minute investigations, it should prove that the gastrula stage did not form a corresponding formation everywhere in the animal kingdom, and that in many cases the organs are formed in different ways from the gastrula, morphological science must not on that account relinquish its *method*, viz. of studying the form-stages of the development. It must, on the contrary, endeavour to find out to what *extent* points of harmony are to be found, and if possible seek reasons for the differences. Should it prove, during this work, that there is no fixed plan of development common to *all* types, each type must be examined separately, in order to find out in what way the types differ from one another.

As the Ascidian development has an exceedingly characteristic developmental stage, in which the embryo consists of 2 layers, I have formerly, and, as I thought, in accordance with the ordinary developmental-historical view, maintained that „die Definition des Entoderms ist ja nicht „Alles was Darm bildet“, sondern das embryonale innere Blatt, das bei der Gastrulation des Eies entsteht.“ I still think that if the definition is not allowed, but „Alles was Darm bildet“, for instance, is used to define endoderm, the endoderm will in the first place become something quite different from what we now understand by it (in the gastrula stage, a much smaller group of cells than our endoderm, which also includes the chorda, mesoderm, etc.); and in the second place, morphological science would then have to find a new word to define the „inner layer of the gastrula larva“, a definition without which it would be far



udviklingen end ellers. Jeg benytter derfor min tidligere definition og skal siden komme til dets fysiologiske synspunkt, hvorfra ogsaa kimbladene kan betragtes.

Betragter vi nu med denne definition for øie den i dette arbejde tidligere beskrevne udviklingsproces, saa maa man fremforalt holde den embryonale og knopudviklingen ud fra hinanden. Mine undersøgelser over den *embryonale* udvikling førte til en bekræftigelse af de ældre med den „erfaringsmæssige kimbladlov“ overensstemmende resultater, og frembyder derfor intet af interesse for kimbladlæren. Ligeledes paaviste jeg, at det var uoverensstemmende med al erfaring, naar *Pizon* mener, at et organ, som peribranchialsækken hos en familie kan udvikle sig fra entodermen (*Botryllus*) og hos andre familier fra ektodermen. Fremforalt hævdede jeg, at det var begrebsmodsigende at anføre et saadant forhold som støtte for kimbladlæren.

Anderledes forholdt sig imidlertid knopudviklingen. Her viste det sig dels at knopanlæggets „indre blære“ snart kan anlægges fra entodermen, snart fra ektodermen, dels ogsaa, at organerne under denne udviklingsproces anlagdes efter en anden lov (en anden *formudvikling*) end under den embryonale udvikling. Dette førte mig imidlertid allerede tidligere (31) til at betragte det materiale, hvoraf knopperne dannes som udifferentieret materiale, der hos en familie kunde forefindes i et ektodermalt, hos en anden familie i et entodermalt organ. At dette er noget bevis mod kimbladlæren i den forstand, som vi ovenfor har udviklet den, kan jeg ikke forstaa. Kimbladlæren omhandler, hvorledes individet bygges op under den embryonale udvikling. Mine resultater lærer altsaa alene, at der under den embryonale udvikling kan bevares udifferentieret materiale og det i begge kimblade, men om organernes dannelse i denne udviklingsproces forøvrig lærer de intet nyt af theoretisk betydning.

Der findes imidlertid ogsaa andre kimbladlærere end den, jeg hidtil har behandlet, og som var et umiddelbart resultat af den udviklingshistoriske erfaring.

Man har forsøgt at forklare den almindelige lov for kimbladenes udvikling dels ud fra udviklingsmekaniske, dels ogsaa fra fylogenetiske synspunkter. I dette kapitel skal vi alene i korthed omtale de udviklingsmekaniske kimbladteorier, specielt da den af *Weismann* forfægtede mosaiktheori og den af *Driesch*, *Hertwig* og *Wilson* udviklede evolutionistiske epigenesistheori. Det ligger udenfor arbejdets ramme at give nogen indgaaende belysning af disse teorier, min opgave vil alene være den ved hjælp af dem at belyse mine egne specielle resultater.

*Driesch* karakteriserer den *Weismannske* teori i følgende ord (16, pag. 3): „*Einer der wesentlichen Elementarprocesse, welche die Entwicklung eines lebenden Wesens*

more difficult than before, to describe the development. I therefore make use of the former definition, and will subsequently come to the physiological point of view from which the germ-layers may also be regarded.

If now, keeping this definition in view, we consider the process of development previously described in this paper, the embryonic and the bud development must first of all be kept distinct from one another. My investigations of the *embryonic* development led to a confirmation of the earlier results that harmonised with the „empirical germ-layer law“, and therefore offer nothing of any interest to the germ-layer theory. I also showed that *Pizon's* theory that an organ like the peribranchial cavity can develop in one family (*Botryllus*) from the endoderm, and in another family from the ectoderm, was contrary to all experience. Above all, I maintained that it was a contradiction of ideas to bring forward such a circumstance in *support* of the germ-layer theory.

The case was otherwise, however, with bud development. It there appeared, partly that the inner vesicle of the rudimentary bud can sometimes originate in the endoderm, and sometimes in the ectoderm; and partly too, that in this developmental process, the organs commenced to form according to another law (another *form-development*) than in the embryonic development. This had already led me (31) to consider the material from which the buds are formed as undifferentiated material, which in one family can be met with in an ectodermal organ, in another family in an endodermal organ. I cannot see that this is any proof against the germ-layer theory in the sense in which we have propounded it above. The germ-layer theory treats of the building up of the animal in the embryonic development. My conclusions too, only teach that during the embryonic development, undifferentiated material can be preserved, and that in both germ-layers; but concerning the formation of the organs in this developmental process, they teach no new thing of theoretical importance.

There are, however, also other germ-layer theories than that of which I have up to the present treated, and which was an immediate result of developmental-historical experience.

An attempt has been made to explain the general law for the development of the germ-layers, starting partly from developmental-mechanical, partly from phylogenetical points of view. In this chapter we will only briefly mention the developmental-mechanical germ-layer theories, particularly the mosaic theory contested by *Weismann*, and the evolutionary epigenesis theory propounded by *Driesch*, *Hertwig* and *Wilson*. It does not come within the scope of this paper to give any detailed information concerning these theories; and my aim will only be by their aid to throw light on my own particular results.

*Driesch* characterises the *Weismann* theory in the following words (16, p. 3): „*Einer der wesentlichen Elementarprocesse, welche die Entwicklung eines lebenden*



bedingen, ist die Zelltheilung. Die Entwicklung ist, neben anderem, eine Folge von Zelltheilungen.

Die gemeinsame Grundansicht von Roux\*) und Weismann geht nun dahin dass jede dieser Theilungen zwei ungleiche Produkte liefert, derart, dass beispielsweise die erste Theilung das „Material“ für die rechte und linke Hälfte des Embryo sondert, die zweite vorn und hinten. Das Resultat dieses Processes ist eine Spezifikation der Zellen in dem Sinne, dass jede Zelle (etwa am Ende der Furchung) einem bestimmten Teile des Körpers nicht nur räumlich entspricht, sondern auch mit Kräften ausgestattet ist, diesen und nur diesen Teil aus sich zu gestalten. Am Ende der Furchung sehen wir also den Keim bestehen aus einer Anzahl von Zellen, von denen keine durch die andere ersetzbar ist, und jede sich für sich zu ihrem spezifischen Resultat entwickelt: der Keim ist ein Mosaik, die Entwicklung Mosaikarbeit“. I hvilken overordentlig grad enkelte forfattere tænker sig selv de allertidligste udviklingsstadier specificeret fremgaar af et citat, som *O. Hertwig* anfører efter *Weismann* (28, pag. 9): „Es wäre unmöglich, dass irgend eine kleine Stelle der Haut des Menschen sich vom Keime aus, d. h. erblich und für sich allein, verändern könnte, wenn nicht in der Keimsubstanz ein wenn auch noch so kleines Lebelement vorhanden wäre, welches gerade dieser Hautstelle entspräche und dessen Variation die der betreffenden Hautstelle nach sich zöge. Verhielte es sich nicht so, so könnte es keine „Muttermäler“ geben.“

I modsætning til denne lære, der altsaa betragter udviklingen overhovedet som en udelukkende synligbliven, udfoldelse af en ligesaa kompliceret, ja ligedan konstrueret mangfoldighed, staar den specielt af *Driesch* og *Hertwig* udviklede epigenetiske teori.

Denne antager, at celledelingen, udviklingen oprindeligt blot er kvantitativ og ikke kvalitativ (2 datterceller er i sit væsen lig modercellen). Naar der imidlertid trods dette kan opstaa forskjelligartede (forskjellig differentierede) anlæg, saa tænker de sig dette afhængigt af: „Bedingungen oder Ursachen, die ausserhalb der Anlagesubstanz der Eizelle liegen, aber trotzdem in gesetzmässiger Folge durch den Entwicklungsprocess producirt werden. Wir erkennen solche erstens in den Wechselbeziehungen, in welche die Zellen eines Organismus, während sie durch Theilung an Zahl zunehmen, in einer stetig verändernden Weise zu einander treten, und zweitens in den Einwirkungen der den Organismus umgebenden Aussenwelt.“ (28, pag. 99).

*Driesch* siger ligefrem (16, pag. 12): „Die prospektive Bedeutung jeder Blastomere ist eine Funktion ihrer Lage im Ganzen.“

Betragter man nu med disse to teorier, mosaiktheorien og den evolutionistiske epigenesistheori, for øie de fakta,

\*) *Roux* har i senere arbejder betonet, at han i væsentlige punkter indtager et andet standpunkt end *Weismann*. Denne fremstilling af mosaiktheorien gjælder derfor *Weismann*'s opfatning, der vistnok hidtil har været antaget af de fleste zoologer.

Wesens bedingen, ist die Zelltheilung. Die Entwicklung ist, neben anderem, eine Folge von Zelltheilungen.

Die gemeinsame Grundansicht von Roux\*) und Weismann geht nun dahin dass jede dieser Theilungen zwei ungleiche Produkte liefert, derart, dass beispielsweise die erste Theilung das „Material“ für die rechte und linke Hälfte des Embryo sondert, die zweite vorn und hinten. Das Resultat dieses Processes ist eine Spezifikation der Zellen in dem Sinne, dass jede Zelle (etwa am Ende der Furchung) einem bestimmten Teile des Körpers nicht nur räumlich entspricht, sondern auch mit Kräften ausgestattet ist, diesen, und nur diesen Teil aus sich zu gestalten. Am Ende der Furchung sehen wir also den Keim bestehen aus einer Anzahl von Zellen, von denen keine durch die andere ersetzbar ist, und jede sich für sich zu ihrem spezifischen Resultat entwickelt: der Keim ist ein Mosaik, die Entwicklung Mosaikarbeit.“ To what an extraordinary degree certain writers imagine even the very earliest developmental stages to be specified, is evident from a quotation made by *O. Hertwig* from *Weismann* (28, p. 9): „Es wäre unmöglich, dass irgend eine kleine Stelle der Haut des Menschen sich vom Keime aus, d. h. erblich und für sich allein, verändern könnte, wenn nicht in der Keimsubstanz ein wenn auch noch so kleines Lebelement vorhanden wäre, welches gerade dieser Hautstelle entspräche und dessen Variation die der betreffenden Hautstelle nach sich zöge. Verhielte es sich nicht so, so könnte es keine „Muttermäler“ geben.“

In opposition to this theory, which considers the development principally as an exclusive realisation, an unfolding of just as complicated and similarly constituted a variety, we have the epigenetic theory specially unfolded by *Driesch* and *Hertwig*.

This assumes that the cell-division, the development, is originally only quantitative and not qualitative (2 daughter-cells are like the mother-cell in their nature). Where however, in spite of this, heterogeneous (variously differentiated) rudiments arise, they imagine this to be dependent on „Bedingungen oder Ursachen, die ausserhalb der Anlagesubstanz der Eizelle liegen, aber trotzdem in gesetzmässiger Folge durch den Entwicklungsprocess producirt werden. Wir erkennen solche erstens in den Wechselbeziehungen in welche die Zellen eines Organismus, während sie durch Theilung an Zahl zunehmen, in einer stetig verändernden Weise zu einander treten, und zweitens in den Einwirkungen der den Organismus umgebenden Aussenwelt.“ (28, p. 99).

*Driesch* indeed says (16, p. 12): „Die prospektive Bedeutung jeder Blastomere ist eine Funktion ihrer Lage im Ganzen.“

If we now, with these two theories, the mosaic theory and the evolutionary epigenesis theory, in view, consider

\*) In more recent works, *Roux* has laid stress on the fact that in essential points he takes up a different position to *Weismann*. This account therefore of the mosaic theory has reference to *Weismann*'s view, which, indeed, has hitherto been accepted by most zoologists.

som de udviklingsmekaniske eksperimenter har beriget videnskaben med, saa forekommer det mig, at alle zoologer, selv *Weismann*, maa indromme, at furingen iallefald ikke er *saa specificeret*, at dens enkelte celler kun *indeholder materialet* til en enkelt bestemt dannelse. Thi en enkelt furingskugle *udvikler sig forskjelligt* alt eftersom den er en del af et furingsstadium eller isoleres.

*Driesch's* eksperimenter over echinideægget, *Roux's* over froskægget, *Wilson's* over amphioxusægget viste, at en enkelt furingskugle af det 2- og 4-cellede stadium kan udvikle sig til et helt individ, og derved viser den sig altsaa at besidde de samme væsentligste *kvaliteter*, som det endnu udelte, befrugtede æg har.

*Driesch's* og *Hertwig's* trykkes eksperimenter viste dernæst, at furingens formstadier lader sig modificere, og at cellerne, naar trykket siden ophæves, dog naar den typiske larveform. *Driesch* drager heraf den slutning: „dass die Furchungskugeln der Echiniden als ein gleichartiges Zellenmaterial anzusehen sind, welches man in beliebiger Weise wie einen Haufen Kugeln durch einander werfen kann, ohne dass seine normale Entwicklungsfähigkeit im mindesten leidet.“

Det forekommer mig vanskeligt at indvende noget mod disse erfaringsmæssigt vundne resultater. Alene det faktum, at en eneste isoleret furingskugle har udviklet sig til en normalt bygget larve, viser med afgjorende sikkerhed, at udviklingen under furingen iallefald ikke altid er en specification i de væsentligste *kvaliteter*, saaledes som man tidligere har tænkt sig. Og er udviklingen alene i et eneste tilfælde ikke specification, saa er ikke specificationen et altbeherskende udviklingsprincip.

Anderledes forholder det sig derimod med det spørgsmaal: „Hvad er aarsagen til, at en isoleret furingskugle, naar den isoleres, faar en impuls til en ny udviklingsretning, saaledes at den ikke danner en bestemt del af et individ, men et helt individ?“ De forklaringer man har givet herfor er ikke umiddelbare erfaringserkjendelser, de er teorier.

*Weismann* forklarer sig saadanne afvigelser fra den ligeforlobende udvikling (regenerationsfænomener) derved, at de saakaldte „Determinanten“ overgiver ledelsen af udviklingen til „die Nebendeterminanten“. (Se 64).

*Roux* og hans skole (se *Barfurth* [1]) mener, at hver blastomer fra furingens første øieblik har en kjerne, „der in seinem aktivierten Material den Kern eines halben Eies (für eine rechte oder linke Körperhälfte, resp. für eine Kopf- oder Schwanzhälfte) darstellt.“ Naar der f. eks. ved isoleringseksperimenterne sker et indgreb i cellens „harmonie“, „werden die regulierenden Fähigkeiten resp. die Thätigkeit des Regenerationsplassons ausgelöst.“

I skarp modsætning hertil siger *Hertwig* (28, pag. 95): „Um die Gastrulation, die Keimblätterbildung und viele andere Erscheinungen der Entwicklung zu erklären hat die

the facts with which developmental-mechanical experiments have enriched science, it seems to me that all zoologists, even *Weismann*, must allow that segmentation is not at any rate *so specified*, that its individual cells only *contain material* for one special formation; for a single segmentation sphere is developed *differently according to whether it is part of a segmentation stage, or is isolated*.

*Driesch's* experiments on the Echinidae ovum, *Roux's* on that of the frog, and *Wilson's* on the Amphioxus egg, showed that a single segmentation sphere of the two and four-celled stages, can develop into an entire animal, and thereby proves itself to be in possession of the same essential *qualities* as those which the still unsegmented ovum possesses.

*Driesch* and *Hertwig's* pressure experiments next showed that the form-stages of the segmentation were capable of modification, and that when the pressure was subsequently removed, the cells still attained the typical larva-form. From this *Driesch* draws the conclusion, „dass die Furchungskugeln der Echiniden als ein gleichartiges Zellenmaterial anzusehen sind, welches man in beliebiger Weise wie einen Haufen Kugeln durch einander werfen kann, ohne dass seine normale Entwicklungsfähigkeit im mindesten leidet.“

It seems to me that it would be difficult to find any objection to these empirically gained results. The very fact that a single isolated segmentation sphere has developed into a normally built larva, proves with conclusive certainty, that development during segmentation is not at any rate always a-specification in the most essential *qualities*, as it was formerly considered to be; and if the development in only a single instance is not specification, then specification is not a ruling principle of development.

Circumstances on the other hand are different with regard to the question: What is the reason of the impulse which an isolated segmentation sphere receives when isolated, to take a new developmental direction, so that it does not form a certain portion of an animal, but an entire animal? The explanations given of this are not immediate acknowledgements of experience; they are theories.

*Weismann* explains such deviations from the even course of development (phenomena of regeneration) by the theory that the so-called „Determinanten“ resigns the conduct of the development to „die Nebendeterminanten“ (see 64).

*Roux* and his school (see *Barfurth*, [1]) think that each blastomere, from the earliest moment of segmentation, has a nucleus. „der in seinem aktivierten Material den Kern eines halben Eies (für eine rechte oder linke Körperhälfte, resp. für eine Kopf- oder Schwanzhälfte) darstellt.“ Where, for instance, by isolation experiments, an encroachment is made on the „harmony“ of the cell, „werden die regulierenden Fähigkeiten resp. die Thätigkeit des Regenerationsplassons ausgelöst.“

In direct opposition to this, *Hertwig* says (28, p. 95): „Um die Gastrulation, die Keimblätterbildung und viele andere Erscheinungen der Entwicklung zu erklären hat die



Determinantenlehre das Verhältniss von Ursache und Wirkung gerade zu umgekehrt. Nicht desswegen, weil Zellen der Blasenwand eine besondere Determinantengruppe“ (qualität) „besitzen, welche ihnen den Stempel, Entodermzellen zu werden, aufdrückt, werden sie in die Furchungshöhle eingestülpt, sondern umgekehrt: dadurch, dass in Folge der Einstülpung, welche aus den Wachstumsverhältnissen der Blasenwand zu erklären ist, eine Zellenfläche in neue Lagebeziehungen zu ihrer Umgebung gebracht wird, wird sie Entoderm, erhält sie den Anstoss, die ihrer besonderen Lage entsprechenden Eigenschaften zu entfalten.“

Betrægter vi nu Ascidieudviklingen fra et udviklingsmekanisk synspunkt, saa har vi først at undersøge, hvorledes og paa hvilket stadium i udviklingen en specifikation indtræder, og dernæst vil vi berøre det spørgsmaal, om Ascidieudviklingen i nogen henseende bidrager til løsningen af det spørgsmaal, om udviklingen er evolution eller epigenese.

*Driesch* studerede udviklingen af enkelte furingskugler hos Ascidierne (*Phallusia mammilata*). Det lykkedes ham af en enkelt furingskugle f. eks. af det 4-cellede stadium ikke alene at udvikle en gastrularlarve men endog en ung larve, hvor chorda mesoderm etc. var anlagt. Af 2 furingskugler af det 4-cellede stadium erholdt han fuldstændig normalt byggede smaa Ascidielarver af den udvikling, som den fritsvømmende larve har. Hvad den isolerede furingskugles specielle udvikling angaar, konstaterede han, at udviklingen fra første øieblik var „kompakt“, det vil sige, den søgte ingenlunde først at udvikle en „halvdannelse“ som f. eks. hoire halvdel af en gastrula. (Se angaaende de nærmere detaljer *Driesch's* afhandling, der indeholder en række af skarpsindige iagttagelser [17]).

Hos de voksne Ascidier har man dernæst iagttaget en høit udviklet regenerationsevne. *Loeb* og *Mingazzini* har iagttaget, at de saakaldte øieflekke rundt ingestionsaabningen og at hele gangliet kan nydannes, naar de fjernes ved operation. Jeg har tidligere havt anledning til selv at overbevise mig herom hos *Ciona intestinalis* ved den zoologiske station i Neapel.

Som støtte for den antagelse, at Ascidierne væv iallefald i den tidligere udvikling ikke er nogen væsensspecifikation, taler efter min opfatning ogsaa deres *knopskydning*.

Vi saa i indledningen og i kap. 4, at tidligere forskere sammenlignede knopskydningen med en deling, og mente, at der hos knopperne ikke fandt nogen nydannelse af organer sted.

Mine undersøgelser førte mig imidlertid til en anden opfatning. Vi saa, at knopanlægget var en overordentlig primitiv dannelse; det bestod af 2 enkle epithelmembraner, og det var os unuligt i det at erkjende moderdyrets forskellige organer, eller selv moderdyrets to primære kimblade, idet det nemlig viste sig, at den vigtige „indre blære“ snart kunde dannes af moderdyrets ectoderm og snart af moderdyrets entoderm. Den indre blæres *bygning* viste

Determinantenlehre das Verhältniss von Ursache und Wirkung gerade zu umgekehrt. Nicht desswegen, weil Zellen der Blasenwand eine besondere Determinantengruppe“ (quality) „besitzen, welche ihnen den Stempel, Entodermzellen zu werden, aufdrückt, werden sie in die Furchungshöhle eingestülpt, sondern umgekehrt: dadurch, dass in Folge der Einstülpung, welche aus den Wachstumsverhältnissen der Blasenwand zu erklären ist, eine Zellenfläche in neue Lagebeziehungen zu ihrer Umgebung gebracht wird, wird sie Entoderm, erhält sie den Anstoss, die ihrer besonderen Lage entsprechenden Eigenschaften zu entfalten.“

If we now consider Ascidian development from a developmental-mechanical point of view, we must first find out how, and in what stage in the development, a specification commences, and then we will touch upon the question as to whether Ascidian development contributes in any respect to the solution of the problem whether the development is evolution or epigenesis.

*Driesch* studied the development of certain segmentation spheres in Ascidians (*Phallusia mammilata*). He succeeded, for instance, in developing from a single segmentation sphere of the four-celled stage, not only a gastrula larva, but also a young larva in which the notochord, mesoderm, etc. were formed. From two segmentation spheres of the 4-celled stage, he obtained small, quite normally built Ascidian larvæ of the same development as that of the free-swimming larva. As regards the special development of the isolated segmentation spheres, he stated that from the very first, the development was „compact“, that is, it made no attempt to develop a semi-formation like, for instance, the right half of a gastrula. (For further details, see *Driesch's* treatise (17), which contains a number of clever observations).

In full-grown Ascidians a highly-developed regenerative power has next been observed. *Loeb* and *Mingazzini* have observed that the so-called ocelli round the branchial aperture, and the entire ganglion can be re-formed when they have been removed by an operation. I had previously had the opportunity of convincing myself on this point in *Ciona intestinalis*, at the zoological station at Naples.

The budding of Ascidians also, in my opinion, speaks in support of the assumption that their tissue, at any rate in the earlier development, is no specification of nature.

We saw in the introduction and in Chapter IV, that earlier anatomists compared budding to a division and thought that in the bud there was no new formation of organs.

My investigations however led me to take another view. We saw that the rudimentary bud was an exceedingly primitive formation. It consisted of two simple epithelial membranes, and it was impossible for us to recognise in it the various organs or even the two primary germ-layers of the parent animal; for it appeared that the important „inner vesicle“ might be formed now from the ectoderm, now from the endoderm, of the parent animal.



sig særdeles enkel, den fremgik oprindelig af faa celler, og trods dette dannede den saa forskellige dannelser som nervesystem og tarmtraktus.

Vi fandt derfor i kap. 4, at knopanklægget lettest kunde sammenlignes med primitive anlæg som f. eks. de isolerede furingskugler i de udviklingsmekaniske eksperimenter.

Med disse har nu knopanklæggene fremforalt det tilfælles, at de

- 1) frembringer et helt individ bygget noiagtig som det, der fremgaar af embryonaludviklingen.
- 2) at anlæggene først synes „bestemte“ til en anden udvikling. De celler, hvoraf den indre blære i knopanklægget dannes, er oprindelig et cellekomplex i et af moderdyrets organer (f. ex. hos *Botrylliden* i peribranchialsækken). Hvis man derfor ikke helt ud hyl-der læren om „Die eingewickelten Keime“, saa maa man antage, at dette cellekomplex ikke paa forhaand er specificeret til dannelse af knopperne, men at det faar stødet hertil under udviklingens løb.

Knopudviklingen forekommer mig derfor i lige høj grad som de udviklingsmekaniske eksperimenter at vise, at ikke al udvikling fra første øieblik er specifikation. Og knopudviklingen lærer os fremdeles, at en specifikation først kan optræde *meget sent i udviklingen*. Det er ikke alene *furingsstadier*, men ogsaa *kimblade* og allerede *anlagte organer*, hvorfra knopanklægget dannes, og disse kimblade og organer maa derfor iallefald blandt sine celler kunne bevare *uspecificeret, indifferent cellemateriale*.

Paafaldende minder den af Caullery (10) beskrevne dobbeltlarve, der findes hos *Diplosoma*, om de eksperimentelt dannede dobbeltlarver. Jeg afbilder denne her efter Caullery.

The structure of the inner vesicle appeared to be extremely simple, originating from few cells; but in spite of that, it formed two such different formations as the nervous system and the alimentary canal.

We therefore found in Chapter IV that the rudimentary bud could most easily be compared with primitive rudiments like the isolated segmentation spheres, for instance, in developmental-mechanical experiments.

In common with these, the bud-rudiments

- (1) produce an entire animal exactly similar in structure to that which proceeds from embryonic development;
- (2) seem first destined for another development. The cells from which the inner vesicle in the bud-rudiment is formed are originally a cluster in one of the organs of the parent animal (in *Botrylliden*, for instance, in the peribranchial cavity). If, therefore, one does not entirely hold the doctrine of „die eingewickelten Keime“, one must presume that this cluster of cells is not specified in advance for the formation of the buds, but that it receives the *impulse to it in the course of the development*.

The development of the bud seems to me therefore to show just as plainly as the developmental-mechanical experiments, that all development is not specification from the very beginning; and bud-development still teaches us that a specification may not appear until *very late in the development*. It is not only the *segmentation stages*, but also the *germ-layers* and the *organs already commenced*, from which the rudimentary bud is formed, and these germ-layers and organs must therefore at any rate be able to preserve among their cells, *unspecified, indifferent cell-material*.

The double larva described by Caullery (10), which is found in *Diplosoma*, strongly recalls the experimentally-formed double larvæ. I here give an illustration of the former after Caullery.

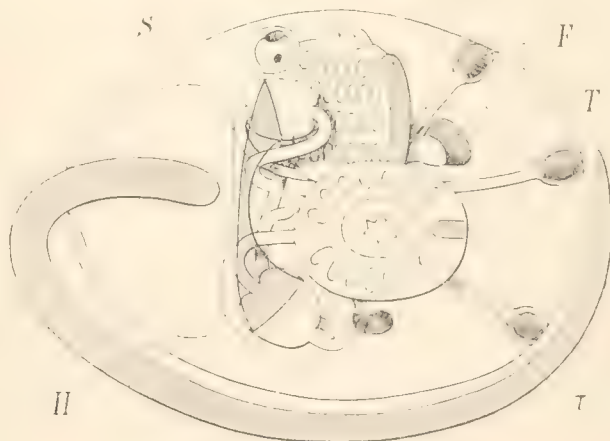


Fig. 14.

*T* = Thorax hos larven; *τ* = thorax hos knoppen, *S* = larvehjernen; *H* = halen med chorda, *F* = fæsteorganer.

Salensky har tidligere beskrevet, at denne dobbeltlarve dannedes ved deling; men Caullery har ved indgaaende undersøgelser vist, at det ene individ, *knoppen*, dannedes ud fra et primitivt anlæg ligesom hos de øvrige familier.

*T* = thorax in the larva; *τ* = thorax in the bud; *S* = larval brain; *H* = tail with notochord; *F* = organ of attachment.

Salensky had previously stated that this double larva is formed by division; but Caullery has shown by minute investigations that the one animal, *the bud*, is formed from a primitive rudiment, as in the other families. He found

Han fandt desuden at det samme er tilfældet hos de saakaldte misdannelser, der findes hos *Didemniderne*. Jeg afbilder igjen paa dette sted *Della Valle's* instruktive figurer fra gruppen *Trididemnum*.

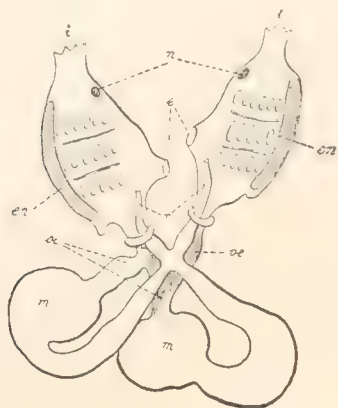


Fig. 15.

Af Korschelt-Heider efter *Della Valle*.

From Korschelt and Heider, after *Della Valle*.

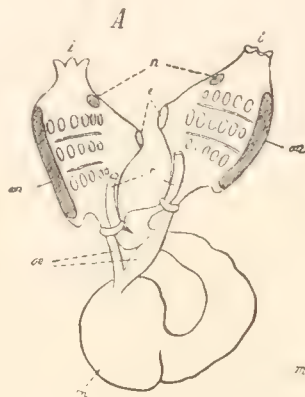


Fig. 16.

Af Korschelt-Heider efter *Della Valle*.

From Korschelt and Heider, after *Della Valle*.

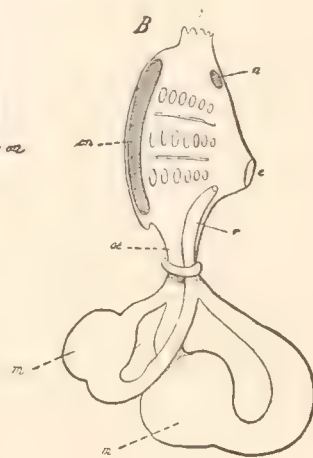


Fig. 17.

Af Korschelt-Heider efter *Della Valle*.

From Korschelt and Heider, after *Della Valle*.

*e* = Egestionsaabning, *cn* = Endostyl, *i* = Ingestionsaabning, *m* = Mave (ventrikel), *n* = Centralnervesystem, *r* = Rektum.

Ogsaa her er knopanlægget, som vi saa i den specielle del en liden cellehob, og organdannelsen foregaar efter de samme principer, som overalt ellers i de sammensatte Ascidiers knopskydning.

Kan saaledes udviklingen til senere stadier bevare indifferent materiale bliver det en af den sammenlignende udviklingshistories vigtigste opgaver at undersøge, naar i udviklingen en specifikation udtræder, og hvad der fremkalder en specifikation.

*Johannes Müller* (44) udtrykker dette med uovertræffelig klarhed: „Wie kommt es, dass gewisse Zellen der organischen Körper, den anderen und der ersten Keimzelle gleich, doch nichts erzeugen können, als ihres Gleichen, d. h. Zellen, aber keineswegs der Keim zu einem ganzen Organismus werden können? Wie die Hornzellen zwar neben sich durch Aneignung von Materie neue Hornzellen, die Knorpelzellen neue Knorpelzellen in sich bilden aber keine Embryonen oder Knospen werden können?“ Han forklarer dette saaledes: „Dieses kann nur davon abhängen, dass diese Zellen, wenngleich die Kraft zur Bildung des Ganzen enthaltend, doch durch eine spezielle Metamorphose ihrer Substanz in Horn und dergleichen eine solche Hemmung erfahren haben, dass sie sowohl bald ihre Keimkraft am Stammorganismus verlieren und, tot geworden, sich abschuppen, als auch, vom Stamm des Ganzen getrennt, nicht wieder Ganzes werden können.“

Meget instruktiv er i Ascidieknoppen forskjellen mellem den indre, indifferente blære, og den ydre epidermisblære. Denne sidste formaar alene ligesom menneskets hornceller at danne celler af samme vævsbeskaffenhed, den indre blære derimod formaar at danne de mest forskjelligartede organer.

too, that it is the same with the so-called mal-formations found in *Didemnide*. I here reproduce *Della Valle's* instructive figures from the group *Trididemnum*.

*e* = atrial aperture; *cn* = endostyle; *i* = branchial aperture; *m* = stomach (ventricle); *n* = central organs of the nervous system; *r* = rectum.

Here too, the bud-rudiment, as we saw in the special section, is a little cellular mass, and the formation of the organs proceeds on the same principles as in all other cases of budding in the Compound Ascidians.

If the development can thus retain indifferent material until later stages, it will become one of the most important objects of comparative developmental history to find out at what time in the development a specification makes its appearance, and what produces a specification.

*Johannes Müller* (44) expresses this with unsurpassable clearness. He says: „Wie kommt es, dass gewisse Zellen der organischen Körper, der anderen und der ersten Keimzelle gleich, doch nichts erzeugen können, als ihres gleichen, d. h. Zellen, aber keineswegs der Keim zu einem ganzen Organismus werden können? Wie die Hornzellen zwar neben sich durch Aneignung von Materie neue Hornzellen, die Knorpelzellen neue Knorpelzellen in sich bilden aber keine Embryonen oder Knospen werden können?“ He explains this as follows: „Dieses kann nur davon abhängen, dass diese Zellen, wenngleich die Kraft zur Bildung des Ganzen enthaltend, doch durch eine spezielle Metamorphose ihrer Substanz in Horn und dergleichen eine solche Hemmung erfahren haben, dass sie sowohl bald ihre Keimkraft am Stammorganismus verlieren und, tot geworden, sich abschuppen, als auch, vom Stamm des Ganzen getrennt, nicht wieder Ganzes werden können.“

The difference between the inner, indifferent vesicle and the outer epidermal vesicle, is very instructive in the Ascidian bud. The epidermal vesicle alone, like the horny cells in man, is capable of forming cells of the same nature of tissue, the inner vesicle, on the other hand, being capable of forming the most varied organs.



At udviklingen formaar op til senere stadier at bevare et indifferent materiale synes mig ogsaa at fremgaa af de patologiske misdannelser og af de saakaldte teratomer. I visse sacraltumorer kan man saaledes undertiden finde alle vævsarter (bruskstykker, tverstribet muskulatur, sandsepiteliet) repræsenterede.

Ogsaa disse bekendte forhold synes derfor at maatte henfores til udifferentieret materiale.

Medens saaledes spørgsmaalet om, *naar* en specifikation indtræder i udviklingen er et problem, der i hvert enkelt tilfælde maa løses ved empiriske undersøgelser, saa er det andet spørgsmaal nemlig, hvori specifikationens væsen bestaar, hvad der betinger den, af meget mere theoretisk art.

Vi saa ovenfor, at *Roux* og hans skole tænker sig, at hver kjerne fra første oieblik er „aktiveret“ for dannelsen af en bestemt del af det voksne dyr (f. eks. venstre kropshalvdel), men at ved skadeligt indgreb, f. eks. adskillelse af en furingskugle, regulerende kræfter, „regenerationsplassonet“ udløses.

*Hertwig* og *Driesch* tænker sig derimod saavel den normale som den forandrede udvikling afhængig af aarsager, der ligger udenfor anlægget selv; og som saadanne aarsager har han nævnt cellernes gjensidige situs i forhold til hinanden, saa udenverdenens kræfter (tryk, varme etc., etc.).

Det forekommer mig, at disse to teorier er to forskjellige udtryk for den ene og samme ting. Begge teorier søger nemlig i virkeligheden at forklare de forandringer i en udviklings forløb, man eksperimentelt kan fremkalde, som en organismes reaktion paa en „Reiz“. Betragter vi *Roux'* teori, at en furingscelle oprindelig er „aktiveret“ for dannelsen af en bestemt del (f. eks. høire kropsdel), men at cellens „regenerationsplasson“ udløses, naar cellen isoleres, hvad udsiger da denne teori andet end, at furingskuglen, naar den udvikler sig under normale forhold („Reize“) danner høire kropsdel og under andre forhold („Reize“) noget andet. Hvad er „aktivering“ og „regenerationsplasson“ andet end organismens forhold overfor normale og anormale „Reize“. Paa den anden side betoner saavel *Hertwig* som *Driesch*, at de aldeles ikke tænker sig, at udenverdenens kræfter virker paa organismen paa anden maade end som „Reiz“. Har man imidlertid opnaaet enighed herom, saa har man vel dermed naaet grænsen for biologiske forklaringer. Man kan vel som biolog studere organismens forhold overfor en bestemt „Reiz“, men derimod er vel selve reaktionens væsen ligesaa utilgængelig for biologisk forskning som perceptionen af sandseindtryk o. s. v. Saadanne diskussioner som om udviklingen skyldes aktiverede indre kvaliteter eller en livskraft eller fysisk-kemiske processer forekommer mig derfor at burde tilhøre andre videnskaber end biologien.

I sine „Leçons sur les phénomènes de la vie“ siger *Claude Bernard*: „Lorsque le physiologiste voudra connaître,

The fact that the development is able to preserve an indifferent material until later stages, seems to me also to be shown by the pathological mal-formations and from the so-called teratomata. In certain sacral tumours all kinds of tissue (cartilage, cross-striped musculature, sensory epithelium) may thus sometimes be found represented.

It would therefore seem as if these well-known circumstances must also be referred to undifferentiated material.

While the question as to *when* a specification commences in the development is a problem which in every single case must be solved by empirical investigations, the other great developmental-mechanical question, namely, in what the nature of the specification consist, upon what it is contingent, is of a much more theoretical nature.

We have seen above that *Roux* and his school imagine each nucleus to be „actuated“ from the very first for the formation of a certain part of the full-grown animal (e. g. the left half of the body), but that by injury, e. g. the separation of a segmentation sphere, regulating forces, the „regenerationsplasson“ is released.

*Hertwig* and *Driesch*, on the other hand, consider both the normal and the altered development to be dependent upon causes outside the rudiment itself; and as such causes they have mentioned the position of the cells in relation to each other, and external forces (pressure, heat, etc., etc.).

It seems to me that these two theories are different expressions for the same thing; for they both in reality attempt to explain the changes in the course of a development which can be experimentally produced, as the reaction of an organism on a „Reiz“. If we consider *Roux's* theory, that a segmentation cell is originally actuated for the formation of a particular part (e. g. the right hand part of the body), but that the cell's „regenerationsplasson“ is released when the cell is isolated, what else does this theory assert than that the segmentation sphere, when developed under normal conditions („Reize“), forms the right hand portion of the body, and under other conditions („Reize“), something else? What are „Aktivierung“ and „Regenerationsplasson“ but the conditions of the organism with regard to normal and abnormal „Reize“? On the other hand both *Hertwig* and *Driesch* accentuate the fact that they by no means consider that external forces affect the organism otherwise than as „Reiz“. If, however, on this point harmony is established, it may be presumed that the limit for biological explanations has been reached. As biologist, one may study the conditions of the organism with regard to a particular „Reiz“, but on the other hand the real nature of the reaction is as inaccessible to biological research as the perception of sense-impressions, etc. Such discussions as to whether the development is due to actuated internal qualities, or to a vital force, or to physical-chemical processes, seems to me therefore, to belong more properly to other branches of science than to biology.

*Claude Bernard*, in his „Leçons sur les phénomènes de la vie“, says: „Lorsque le physiologiste voudra connaître,



provoquer les phénomènes de la vie, agir sur eux, les modifier, ce n'est pas à la *force vitale*\*), entité insaisissable, qu'il lui faudra s'adresser, mais aux conditions physiques et chimiques qui entraînent et commandent la manifestation vitale." Saaledes bor efter min formening ogsaa spørgsmaalet om epigenesis eller evolution i udviklingen alene besvares ved undersøgelser over, hvorledes udviklingen forholder sig til bestemte morphologiske begreber, som celler, kimblade, organer o. s. v.

Fra dette synspunkt er Ascidiernes knopskydning som al *udvikling* epigenese. Knopskydningen begynder nemlig med et anlæg, der ikke viser nogen af Ascidiernes organer eller kimblade, men som derimod bestaar af et lidet antal celler, der ved complicerede processer danner det voksne dyr. Betragter man nu udviklingen som reaktioner paa „Reize“, saa maa man antage at anlægget oprindeligt har udviklet sig som del af et af moderdyrets organer, men at det da under udviklingen har erholdt en impuls til udvikling i anden retning. Hos *Botrylliderne* er saaledes cellerne i knopanlæggets indre blære først en del af moderdyrets peribranchialsæk, indtil de sonder sig ud fra denne og danner et andet individ. At fremdeles andre forhold og Reize ogsaa maa finde sted under knoppens udvikling fremgaar deraf, at denne forløber anderledes end i embryonaludviklingen. Saaledes nævntes ovenfor at knopanlæggets ydre blære ikke formaar at danne andet end Ascidiens epidermis, og at f. eks. nervesystemet fremgaar af den indre blære. Ogsaa dette viser bestemt:

- 1) At forandrede forhold („Reize“) formaar at forandre udviklingens forløb.
- 2) At organismen formaar under andre forhold paa anden maade at danne den ene og samme formdannelse (arts-typen).

Det vil utvivlsomt være forkastet at søge at paavise hvilke forandringer i anlægget der fremkalder forandringer i udviklingens forløb. Man kan kun her udtale sig med den største forsigtighed. Jeg har ovenfor nævnt at den omstændighed at knoppens ydre blære bestaar af en differentieret epidermis maa antages at modificere knopskydningen. Paa den anden side nævntes, at entodermen hos *Ascidieæggenes* antagelig paavirkedes i sit forhold ved de store mængder blommemasse, der i enkelte grupper (*Distaplia*) kom til udvikling, en tanke som *Balfour* forlængst har udtalt for Teleostieræggenes vedkommende.

Saadanne eksempler formaar imidlertid alene at *antydde* en enkelt faktor og de er utvivlsomt alene den første famlende begyndelse til opfatninger og erfaringer, som en fremtidig videnskab vil bringe til en anden klarhed.

\*) Ordet „Livskraften“ involverer ikke her ligesaa lidt som hos Claude Bernard nogensomhelst metafysisk opfatning, men er alene et navn paa det metafysiske problem.

provoquer les phénomènes de la vie, agir sur eux, les modifier, ce n'est pas à la *force vitale*\*), entité insaisissable, qu'il lui faudra s'adresser, mais aux conditions physiques et chimiques qui entraînent et commandent la manifestation vitale." In my opinion, should one attempt to elucidate the question of epigenesis or evolution in development, by nothing but investigations as to the relation of the development to certain morphological conceptions, such as cells, germ-layers, organs, etc.

From this point of view, the budding of Ascidians, like all *development* is epigenesis. Budding begins with a rudiment which shows none of the Ascidian organs or germ-layers, but which, on the contrary consists of a small number of cells, which, by complicated processes, form the adult animal. If the development be considered as reaction on „Reize“, we must presume that the rudiment has originally developed as part of one of the organs of the parent animal, but that during development it has acquired an impulse to develop in another direction. Thus in *Botryllidae*, the cells in the inner vesicle of the bud-rudiment are at first part of the peribranchial cavity of the parent animal, until they separate from it, and form another animal. That yet other conditions and „Reize“ may also occur during the development of the bud, arises from the fact that that development takes a different course to that of the embryonic development. In this way it has been mentioned above that the outer vesicle of the bud-rudiment is only capable of forming the Ascidian's epidermis, and that, e. g. the nervous system proceeds from the inner vesicle. This, too, shows decidedly:

- (1) That altered conditions („Reize“) are capable of altering the course of the development;
- (2) That under other conditions the organism is capable of forming, in another way, the same form-formation (type of the species).

It would without doubt be premature to attempt to demonstrate what are the changes in the rudiment, which produce changes in the course of the development. It is only with the greatest caution that one can express an opinion. I have stated above that we must presume that the budding is modified by the circumstance that the outer vesicle of the bud consists of a differentiated epidermis. On the other hand, it is stated that the endoderm in Ascidian ova is probably affected in its conditions by the great quantity of yolk which was developed in certain groups (*Distaplia*), a thought which *Balfour* has long since expressed with regard to the ova of Teleosteans.

Such instances, however, can only indicate a single factor, and are doubtless only the first uncertain commencement to the comprehension and experience which future science will carry on to a different degree of clearness.

\*) Neither here nor as used by Claude Bernard do the words „force vitale“ express any metaphysical view; they are merely a name for the metaphysical problem.

## Kapitel 6.

### Ascidiernes udvikling og den biogenetiske grundlov.

*Haeckel* betegner sin biogenetiske grundlov med følgende ord (21, kap. 20): „Die Ontogenese oder die Entwicklung der organischen Individuen, als die Reihe von Form-Veränderungen, welche jeder individuelle Organismus während der gesamten Zeit seiner individuellen Existents durchläuft, ist unmittelbar bedingt durch die Phylogenese oder die Entwicklung des organischen Stammes (Phylon), zu welchem derselbe gehört. Die Ontogenese ist die kurze und schnelle Recapitulation der Phylogenese, bedingt durch die physiologischen Functionen der Vererbung (Fortpflanzung) und Anpassung (Ernährung). Das organische Individuum wiederholt während des raschen und kurzen Laufes seiner individuellen Entwicklung die wichtigsten von denjenigen Formveränderungen, welche seine Voreltern während des langsamen und langen Laufes ihrer palaeontologischen Entwicklung nach den Gesetzen der Vererbung und Anpassung durchlaufen haben.“

Allerede de første arbejder over Ascidiernes udvikling fremhævede Ascidierlarverne som et af de interessanteste eksempler paa recapitulation af den phylogenetiske udvikling i embryonaludviklingen, og eksemplet frembød her desto større interesse som Ascidierlarven viste en væsentlig anden organisationstypus (hvirveldyrenes) end det voksne dyr, der, betragtet alene for sig, maa tilskrives en forholdsvis enkel og lavtstaaende organisation. Man betragtede derfor almindelig Ascidierne som degenererede hvirveldyrlignende former. *Richard Hertwig* (29) giver denne opfatning udtryk i følgende ord: „Die überraschenden Entdeckungen, welche vor vier Jahren *Kowalevsky* über die embryonale Entwicklung der Ascidien veröffentlichte, haben die Aufmerksamkeit der Zoologen dieser merkwürdigen Thiergruppe in einem früher unbekannten Maasse zugewendet. Die höchst interessante und wichtige Uebereinstimmung welche nach jenen, inzwischen von *Kupffer* bestätigten Entdeckungen in der individuellen Entwicklung zwischen den niedrig organisierten Würmern und dem niedrigsten Wirbelthiere, dem *Amphioxus*, besteht, hat einen gänzlich unerwarteten Lichtstrahl in die dunkle Stammesgeschichte der Thiere hinein fallen lassen. Denn eingedenk des innigen ursächlichen Zusammenhanges, welcher zwischen der Ontogenie und Phylogenie der Organismen, zwischen der individuellen Entwicklungsgeschichte des Thieres und der palaeontologischen Geschichte seiner Vorfahren besteht, muss man aus jener ontogenetischen Uebereinstimmung zwischen *Amphioxus* und den Ascidien unmittelbar den höchst wichtigen phylogenetischen Schluss ziehen dass die gemeinsame Stammform aller Wirbelthiere unter allen uns bekannten Thierformen mit den Ascidien die nächste Verwandtschaft besessen und mit ihnen aus einer gemeinsamen älteren Stammform sich entwickelt hat.“ Tidlige forskere har nu ogsaa efter *Kowalevsky* og *r. Kupffer* indgaaende studeret Ascidiernes udvikling; fremforalt nævner jeg her *r. Bene-*

## Chapter VI.

### Ascidian Development and the Biogenetic Fundamental Law.

*Haeckel* describes his biogenetic fundamental law in the following words (21, chap. 20): „Die Ontogenese oder die Entwicklung der organischen Individuen, also die Reihe von Form-Veränderungen, welcher jeder individuelle Organismus während der gesamten Zeit seiner individuellen Existents durchläuft, is unmittelbar bedingt durch die Phylogenese oder die Entwicklung des organischen Stammes (Phylon), zu welchem derselbe gehört. Die Ontogenese ist die kurze und schnelle Recapitulation der Phylogenese, bedingt durch die physiologischen Functionen der Vererbung (Fortpflanzung) und Anpassung (Ernährung). Das organische Individuum wiederholt während des raschen und kurzen Laufes seiner individuellen Entwicklung die wichtigsten von denjenigen Formveränderungen, welche seine Voreltern während des langsamen und langen Laufes ihrer palaeontologischen Entwicklung nach den Gesetzen der Vererbung und Anpassung durchlaufen haben.“

The very earliest works on the subject of Ascidian development pointed out the Ascidian larva as one of the most interesting examples of recapitulation of the phylogenetic development in the embryonic development; and the example here offered the greater interest, from the fact that the Ascidian larva exhibited a type of organisation (that of vertebrate animals) essentially different from that of the adult animal, which, considered quite independently, must be attributed to a comparatively simple and low organisation. The Ascidiae were therefore generally regarded as degenerate, vertebrate-like forms. *Richard Hertwig* (29) gives the following expression to this view: „Die überraschenden Entdeckungen, welche vor vier Jahren *Kowalevsky* über die embryonale Entwicklung der Ascidien veröffentlichte, haben die Aufmerksamkeit der Zoologen dieser merkwürdigen Thiergruppe in einem früher unbekannten Maasse zugewendet. Die höchst interessante og vigtige Uebereinstimmung welche nach jenen, inzwischen von *Kupffer* bestätigten Entdeckungen in der individuellen Entwicklung zwischen den niedrig organisierten Würmern und dem niedrigsten Wirbelthiere, dem *Amphioxus*, besteht, hat einen gänzlich unerwarteten Lichtstrahl in die dunkle Stammesgeschichte der Thiere hinein fallen lassen. Denn eingedenk des innigen ursächlichen Zusammenhanges, welcher zwischen der Ontogenie und Phylogenie der Organismen, zwischen der individuellen Entwicklungsgeschichte des Thieres und der palaeontologischen Geschichte seiner Vorfaren besteht, muss man aus jener ontogenetischen Uebereinstimmung zwischen *Amphioxus* und den Ascidien unmittelbar den höchst wichtigen phylogenetischen Schluss ziehen, dass die gemeinsame Stammform aller Wirbelthiere unter allen uns bekannten Thierformen mit den Ascidien die nächste Verwandtschaft besessen, und mit ihnen aus einer gemeinsamen älteren Stammform sich entwickelt hat.“ Numerous anatomists after *Kowalevsky* and *r. Kupffer* have care-



den & Julin, Seeliger og Willey og disse forskere har i høieste grad vist, hvorledes Ascidielarven er en ganske anderledes høit organiseret form end det voksne dyr.

Det ligger nu helt udenfor min opgave at ville levere noget bidrag til Ascidiernes fylogeni, mine studier har ikke været rettet mod dette maal og jeg henviser i den anledning til de ovennævnte forfattere. Derimod vil jeg med faa ord omtale den i Kap. 4 anstillede sammenligning mellem larve- og knopudvikling i almindelighed, og søge at belyse de der rundne resultatets forhold til den biogenetiske grundlov.

Vi saa i Kapitel 5, at knopskydningen væsentlig afveg fra larveudviklingen deri, at den

1) var en forkortning af larveudviklingen.

2) at organdannelsen foregik efter en væsentlig anden plan end embryonaludviklingen.

Der fandtes i knopudviklingen intet gastrulastadium; hverken sandseblæren, chorda, hale etc. kom til anlæg. Seeliger siger (57, pag. 45) meget træffende: „Gerade die Stadien fehlen, auf welche die Wirbelthierverwandtschaft begründet wurde.“

Vi staar saaledes her overfor det eiendommelige forhold, at en gruppe kan have 2 udviklingsmodi, af hvilke den ene efter forskernes mening rekapitulerer, den anden ikke rekapitulerer alle de stadier, der minder om hvirveldyrenes bygning. Seeliger, der synes at have haft sin opmærksomhed specielt henvendt paa dette punkt, søger fylogenetisk at forklare dette saaledes, at Ascidierne først begyndte at knopskyde, efterat de hvirveldyrlignende stadier (stadier i fylogenetisk betydning) var passeret, altsaa som fastsiddende dyr.

Efter analogi med andre fylogenetiske teorier kan jeg tænke mig, at man vil søge at forklare det faktum, at knopudviklingen ikke viser de hvirveldyrlignende stadier, paa en af 2 maader.

Enten vil man mene, at larvernes udvikling virkelig er rekapitulation, men at knopperne ikke „behøver“ at rekapitulere dem, da de fra begyndelsen af er fastsiddende og ikke har noget larvestadium, i hvilket de kunde bruge sin larvehjerne og sin hale. Sammenlign Langs interessante: Ueber den Einfluss der festsitzenden Lebensweise auf die Thiere (41 b).

Eller ogsaa vil man sige, at larven ikke er en rekapitulation af den fylogenetiske udvikling, men alene repræsenterer en tilpasning til det fritsvømmende stadium, der er af tordel for artens udbredelse, men som ikke er af betydning for knopperne, der danner kolonierne.

Begge disse teorier slutter derfor, at hvis en rekapitulation overhovedet finder sted hos Ascidierne, saa kan den dog helt bortfalde, naar den ikke er af direkte betydning for individernes eksistens paa det ene eller andet stadium.

I Kapitel 4 saa vi, at gastrula-stadiet forholdt sig paa lignende maade. Det lykkedes os ikke i knopudvik-

fully studied the development of Ascidians. Among them I would specially name *v. Beneden and Julin, Seeliger and Willey*, and these anatomists have shown most distinctly that the Ascidian larva is a far more highly organised form than the adult animal.

It is quite outside the scope of my subject to make any contribution to the phylogeny of Ascidiæ; my studies have not been directed towards that object, and on that head, I would refer to the above-named authors. On the other hand I will briefly discuss the comparison put forward in Chapter IV, between larval and bud development in general, and try to throw some light on the relation of the results there gained, to the biogenetic fundamental law.

We saw in Chapter IV that the chief differences between bud and larval development were:

(1) That budding was an abbreviation of the larval development;

(2) That the formation of the organs proceeded on an essentially different plan in the two modes of development.

In budding there was no gastrula stage, no rudiments of sensory vesicles, notochord, tail, etc. Seeliger very aptly says (57, p. 45): „Gerade die Stadien fehlen, auf welche die Wirbelthier-verwandtschaft begründet wurde.“

We thus stand face to face with the peculiar fact of a group having two methods of development, one of which, according to the opinion of anatomists, recapitulates, and the other does not recapitulate all the stages that recall the structure of the vertebrate animal. Seeliger, who seems to have had his attention especially turned to this point, seeks to explain it phylogenetically, by saying that the Ascidiæ did not begin to produce buds until after the vertebrate-like stages (stages in the phylogenetic sense) were passed, in other words not until they became stationary animals.

After analogy with other phylogenetic theories, I can fancy that attempts will be made to explain in one of two ways, the fact that budding does not show the vertebrate-like stages.

It will either be held that the development of the larva is really rekapitulation, but that the buds do not „need“ to recapitulate, as they are attached from the very first, and have no larva stage in which they can use their larval brain and their tail (cf. Lang's interesting „Ueber den Einfluss der festsitzenden Lebensweise auf die Thiere“ [41 b]); or it will be said that the larva is not a rekapitulation of the phylogenetic development, but only represents an adaptation to the free-swimming stage, which is advantageous to the spread of the species, but is of no importance to the buds which form the colonies.

Both these theories conclude therefore, that if, on the whole, a rekapitulation takes place in Ascidians, it may entirely be omitted when of no direct importance to the existence of the animal in one stage or the other.

In Chapter IV, we saw that the gastrula stage was very similar. We did not succeed in finding, in the bud-



lingen at finde noget stadium, der i bygning eller dannelsesmaade kunde sammenlignes med det embryonale gastrula-stadium. Ved nærmere betragtning viste det sig, at det tobladede knopankæg, der fremviste en vis ydre lighed med en gastrula, dog var en væsentlig anderledes bygget formdannelse.

Jeg vil med faa ord søge at redegjøre for, hvorledes disse forhold kan opfattes i theoretisk henseende. Først og fremst vil jeg fremhæve, at *mine undersøgelser* ikke tillader nogen slutning angaaende det spørgsmål, hvorvidt Ascidiendviklingen overhovedet er en recapitulation. Dette er et spørgsmål, der gaar langt ud over undersøgelsernes ramme. Vort maal er derimod at levere et bidrag til lovene for de formstadiers dannelse, der almindelig bekrives som recapitulationsstadier.

Hvis min fremstilling af Ascidiernes udvikling er rigtig, saa fremgaar deraf, at det, der almindelig beskrives som recapitulation af den fylogenetiske udvikling, *er en overordentlig variabel faktor i individernes udviklingshistorie, hvis optræden synes helt afhængig af, om den er af betydning for udviklingsstudierne selv*. Vi har seet, at en Ascidie i knopudviklingen kan dannes uden i sin udvikling at gennemløbe noget gastrula- eller larvestadium.

Er det nu berettiget som ovenfor af knopudviklingen at drage almindelige slutninger over udviklingens principer? Tidligere forfattere har ment, at knopudviklingen i det hele er en proces, der i sit væsen nærmest er at opfatte som en delingsproces, hvor ingen nydannelse forekommer. Efter de specielle resultater, som er fremlagt i dette arbejde, er dog ikke længer en saadan opfatning mulig for Ascidiernes vedkommende. Vi saa knoppen begynde som et ganske lidet, særdeles primitivt anlæg, og organudviklingen viste sig i sit forløb ikke væsentlig mindre compliceret end i den embryonale udvikling. Da nu de dyr, der dannes ved knopudviklingen i alle henseender er identiske med de dyr, der fremgaar af larverne, saa maa den ene dannelsesmaade ligesaafuldt som den anden i sit væsen kaldes en nydannelse, en udvikling. *Driesch* siger træffende angaaende de forskellige forsøg, der er gjort paa at opfatte al knopskydning som regeneration, deling (16, pag. 121): „Schliesslich kann man ja aber auch die Entwicklung aus dem Ei Regeneration nennen: es fehlt eben alles bis auf eine Zelle; eine solche Wortverwendung würde uns freilich nicht weiter bringen.“

Om knopudviklingen end ikke helt kan sammenlignes med embryonaludviklingen, saa er den dog iallefald en saa distinct udviklingsproces, at ogsaa den maa kunne belære os om udviklingens væsen overhovedet.

Det paafaldende er imidlertid da, at det hele skema for organudviklingen hos knopperne er saa overordentlig forskellig fra organdannelsen hos ægget, medens erfaringen ellers viser, at selv fjerntstaaende grupperes embryonaludviklinger indbyrdes stemmer meget overens. Saaledes staar

development, any stage which, in structure or manner of formation could be compared with the embryonic gastrula stage. On more careful consideration, it proved that the two-layered bud-rudiment, which had a certain external resemblance to a gastrula, was yet a formation of an essentially different structure.

I will briefly try to show how these facts may be regarded from a theoretical point of view. I will first of all lay stress upon the fact that *my investigations* do not permit of any conclusion being drawn on the question as to how far Ascidian development, on the whole, is a recapitulation. This is a question which goes far beyond the scope of our investigations. Our object, on the other hand, is to make a contribution to the laws for the formation of those form-stages which are generally described as recapitulation stages.

If my account of the development of Ascidiens is correct, it follows that what is generally described as a recapitulation of the phylogenetic development, is *an exceedingly variable factor in the developmental history of the animal and one whose appearance seems to depend entirely upon its signification to the developmental stages themselves*. We have seen that in bud-development, an Ascidian can be formed without going through any gastrula or larva stage in its development.

Are we justified in drawing from the bud-development general conclusions, as above, as to the principles of development? Earlier writers have thought that bud-development on the whole is a process which, in its nature, should more properly be regarded as a fission process, where no new formation occurs. According, however, to the special results set forth in this paper, such a view is no longer tenable, as far as Ascidiens are concerned. We saw the bud begin as a very small, exceedingly primitive rudiment; and the development of the organs proved to be in reality no less complicated in its course, than in that of the embryonic development. As the animals formed by bud-development are identical in every respect with those proceeding from larvæ, the one mode of formation must be considered in its nature to be quite as much a new formation, a development, as the other. *Driesch* very aptly says concerning the various attempts that have been made to regard all budding as regeneration or fission (16, p. 121): „Schliesslich kann man ja aber auch die Entwicklung aus dem Ei Regeneration nennen: es fehlt eben alles bis auf eine Zelle; eine solche Wortverwendung würde uns freilich nicht weiter bringen.“

Although bud-development does not altogether admit of comparison with embryonic development, it is at any rate so distinct a developmental process as to be capable of teaching us about the nature of the development in particular.

The remarkable thing however is that the whole schema of organic development in the buds is so exceedingly different from the organ-formation in the ovum, while experience elsewhere shows that even in widely separated groups, there is a great mutual agreement in the embryonic

*Heymons* resultater, at midttarmen hos Myriapoderne dannes fra entodermen og hos visse insekter fra ektodermen som en sjelden uoverensstemmelse.

Det synes, som om man heraf maa kunne drage den slutning, at udviklingens forløb ikke altid først og fremst betinges af slægtskabet (den fylogenetiske udvikling). Derimod synes udviklingen i høiere grad at være modificerbar end man vel hidtil almindelig har antaget. *Anlæggets, begyndelsesstadiets* form og bygning synes at spille en stor rolle, ja synes altsaa endog at kunne bringe enhver saakaldet recapitulation til at bortfalde, et forhold, som vel er det samme som det af Haeckel kaldet *caenogeni*. Interessant er i denne henseende, at de forskellige Ascidiers knopskydninger indbyrdes viser ligesaa store overensstemmelser som embryonaludviklingerne, skjønt knopskydningerne visse- lig intet har med recapitulation at gøre.

Et eksperimentalt bevis for udviklingens store foranderlighed er givet af G. Wolff (Entwicklungsphysiologische Studien. Archiv für Entwicklungsmechanik. Bd. I. 1895), der fandt, at naar linsen hos Triton taeniatus fjernedes, regenereredes den fra epithelcellerne i Iris. Her er altsaa ogsaa en nydannelse, om ikke af et helt individ, saa dog af et organ og ogsaa denne nydannelse finder sted paa en væsentlig anden maade end under embryonaludviklingen. Kan imidlertid saa store forandringer i den maade, hvorpaa nydannelser finder sted, forekomme, saa synes det mig at vise, at man endnu maa udtale sig med stor forsigtighed om, hvad der er fylogenetisk recapitulation.

Man maa fremdeles undlade at drage altfor vidtgaaende slutninger fra udviklingshistorien over de forskellige typers slægtskabsforhold. Naar enkelte forfattere gaar saa vidt, at de siger, at de tilsvarende organer hos Ascidieknopperne og Ascidielarven ikke er „homologe“, fordi de ikke dannes paa tilsvarende maade af *kimbladene*, da viser dette tilstrækkelig, til hvilken forvirring en ensidig vurdering af udviklingshistorien kan føre. Thi hvis de tilsvarende organer, som centralnervesystemet, ikke er homologe hos individer af samme art, da er vel dermed overhovedet enhver morfologisk betragtning, end sige da sammenlignende betragtning opgivet.

Før man udnytter udviklingshistorien, især dens erfaringer fra de *tidligere stadier* til indgaaende sammenligning mellem de forskellige typer, maa man utvivlsomt søge at *klargjøre sig de almindelige love for udviklingen i høiere grad end hidtil*. Og under dette arbejde vil utvivlsomt studiet af kimbladene, deres dannelse og skjæbne forblive et af den *morfologiske* udviklingshistories vigtigste problemer.

Jena, Januar 1896.

development. In this respect, *Heymons'* conclusion, that the mid-gut in Myriapoda is formed from the entoderm, and in certain insects from the ectoderm, stands as an exceptional incongruity.

From this it seems as if one ought to be able draw the conclusion that the course of development is not always primarily contingent upon relationship (the phylogenetic development). On the other hand the development seems to be more capable of modification than has hitherto generally been supposed. The form and structure of the *rudiment*, the *primitive stage*, seems to play an important part, to be able, indeed, to cause the abandoning of all so called recapitulation, a circumstance which is probably the same as Haeckel's so-called *caenogeny*. It is interesting to find that in this respect the buddings in the different Ascidian groups exhibit just as great conformity to one another, as do the embryonic developments, though the buddings certainly have nothing to do with recapitulations.

One experimental proof of the great variableness of development is given by G. Wolff (Entwicklungsphysiologische Studien. Archiv für Entwicklungsmechanik. Bd. I. 1895), who found that when the lense in Triton taeniatus was removed, it was regenerated from the epithelial cells in the iris. Thus here too there is a new formation, if not of an entire animal, yet of an organ, and this new formation, too, takes place, in a manner essentially different to that in embryonic development. If, however, such great changes can occur in the manner in which the new formation takes place, it seems to me to show that great caution must still be used in assertions as to what is phylogenetic recapitulation.

It will not do, either, to draw too far-going conclusions from the developmental history of the relationship of the various types. When certain writers go so far as to say that the corresponding organs in the Ascidian bud and the Ascidian larva are not „homologous“, because they are not formed in a corresponding manner from the *germ-layers*, this sufficiently shows to what confusion a one-sided valuation of developmental history may lead; for if corresponding organs, such as the central organs of the nervous system, are not homologous in animals of the same species, then every morphological view, to say nothing of comparative views, must be given up.

Before utilising developmental history, and especially its experiences of the *earlier stages*, for a detailed comparison between the different types, we must endeavour to *clear up the general laws of development more completely than heretofore*; and in doing this, the study of germ-layers, their formation and destiny will undoubtedly continue to be one of the greatest problems of *morphological* developmental history.

Jena. January, 1896.



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## Figurforklaring.

### Forkortelser.

<i>B-S</i>	= Branchialsæk, gjælletarm.
<i>Cell</i>	= Cellulosekappen.
<i>Cl</i>	= Cloaken.
<i>Ch</i>	= Chorda.
<i>CN</i>	= Canalis neurentericus.
<i>D-R</i>	= Dorsalrøret hos knopperne (anlægget til hypophysis og centralnervesystem).
<i>D-Pbc</i>	= Høire anlæg til peribranchialsækken (Pbc).
<i>Eg</i>	= Egestionsaabning.
<i>End</i>	= Endostyl.
<i>Ekt</i>	= Ektoderm.
<i>Ent</i>	= Entoderm.
<i>Ent. St</i>	= Stolonens „entodermstreng“.
<i>Ep</i>	= Epidermis.
<i>Epic</i>	= Epicardium.
<i>F</i>	= Forbindelse mellem moderdyr og knop.
<i>Fæst</i>	= Fæsteorganer.
<i>Fl</i>	= Flimmergrube.
<i>G</i>	= Gjællespalter.
<i>Genst</i>	= Anlæg til generationsorganer.
<i>H</i>	= Hjerte.
<i>Ha</i>	= Hale.
<i>Hyp</i>	= Hypophysis.
<i>Ig</i>	= Ingestionsaabning.
<i>Kn</i>	= Knop eller knopanlæg.
<i>K-I</i>	= Knopanlæggets „indre blære“.
<i>K-Y</i>	= Knopanlæggets „ydre blære“.
<i>Kn (1), Kn (2)</i>	= Knop Nr. 1 og Nr. 2 hos Pyrosoma.
<i>Lh</i>	= Larvehjerne.
<i>M</i>	= Mave (ventrikel).
<i>Md-R</i>	= Medullarrør hos larverne.
<i>M-T</i>	= Knopskydende „moderdyr“.
<i>N-R</i>	= Nerverøret hos Pyrosoma.
<i>Nst</i>	= Nervestreng.
<i>Æ</i>	= Æsophagus.
<i>Ov</i>	= Ovarier.
<i>Pc</i>	= Pericardium (Pc + H = Pericard + Hjerte).
<i>Pbc</i>	= Peribranchialsæk.
<i>Postabd</i>	= Postabdomen.
<i>R</i>	= Rectum.
<i>Sk</i>	= „Skilleæg“ i postabdomen eller stolonerne.
<i>S. Pbc</i>	= Venstre Pbc.anlæg.
<i>St</i>	= Stolo (hos Pyrosoma, Perophora, Botryllus).
<i>T</i>	= Tarm.
<i>Ut</i>	= Urtarm.

## Explanation of the Plates.

### List of Abbreviations.

<i>B-S</i>	= Branchial sac, branchial gut.
<i>Cell</i>	= cellulose tunic.
<i>Cl</i>	= cloaca.
<i>Ch</i>	= chorda.
<i>C-N</i>	= neurenteric canal.
<i>D-R</i>	= dorsal tube in the buds (rudiment of the hypophysis and neural centre).
<i>D-Pbc</i>	= right rudiment of peribranchial cavity (Pbc).
<i>Eg</i>	= atrial aperture.
<i>End</i>	= endostyle.
<i>Ekt</i>	= ectoderm.
<i>Ent</i>	= endoderm.
<i>Ent. St.</i>	= endodermal cord of the stolon.
<i>Ep</i>	= epidermis.
<i>Epic</i>	= epicardium.
<i>F</i>	= connection between parent animal and bud.
<i>Fæst</i>	= organs of attachment.
<i>Fl</i>	= dorsal tubercle.
<i>G</i>	= branchial stigmata.
<i>Genst</i>	= rudiment of the generative organs.
<i>H</i>	= heart.
<i>Ha</i>	= tail.
<i>Hyp</i>	= hypophysis.
<i>Ig</i>	= oral aperture.
<i>Kn</i>	= bud or bud-rudiment.
<i>K-I</i>	= inner vesicle of bud-rudiment.
<i>K-Y</i>	= outer vesicle of bud-rudiment.
<i>Kn (1), Kn (2)</i>	= buds No. 1 and No. 2 in Pyrosoma.
<i>Lh</i>	= larval brain.
<i>M</i>	= stomach (ventricle).
<i>Md-R</i>	= medullary tube in larva.
<i>M-T</i>	= bud-producing parent animal.
<i>N-R</i>	= nerve tube in Pyrosoma.
<i>Nst</i>	= nerve cord.
<i>Æ</i>	= æsophagus.
<i>Ov</i>	= ovaries.
<i>Pc</i>	= pericardium (Pc + H = pericardium + heart).
<i>Pbc</i>	= peribranchial sac.
<i>Postabd</i>	= post-abdomen.
<i>R</i>	= rectum.
<i>Sk</i>	= wall in post-abdomen or stolons.
<i>S. Pbc</i>	= left rudiment of peribranchial cavity.
<i>St</i>	= stolon (in Pyrosoma, Perophora and Botryllus).
<i>T</i>	= intestine.
<i>Ut</i>	= primitive intestine.



## Pl. IX.

Fig. 1—4. *Perophora Listeri*.

Efter *Kowalevsky* (37); fig. 1 ogsaa afbildet af *Heider* (23).

- Fig. 1. Del af stolo visende anlægget af knopperne ved udbugtning af stolonens skillevæg (*sk*), der efter *Kowalevsky's* beskrivelse og egne iagttagelser er indtegnet som en dobbeltlamelle. (*Kowalevsky*, fig. 1).
- Fig. 2. Ung knop visende den „indre blæres“ første udviklingsstadier (*Kowalevsky*, fig. 9).
- Fig. 3. Ældre stadium, der dog endnu hænger i intim forb. med moderdyret (denne sees ikke paa fig. 2, fordi knoppen sees fra dorsalsiden). Pbc dannet ved sammensmeltning af de 2 laterale anlæg. Den første antydning til disse sees paa fig. 2 (*Kowalevsky*, fig. 13).
- Fig. 4. Ældre knop (*Kowalevsky*, fig. 14).
- I fig. 3 og 4 er nervesystemets (*D-R*) og peribranchialsækkens forhold mere klart fremstillede end hos *Kowalevsky* efter egne iagttagelser.

Fig. 5—8. *Botryllidæ*.

Efter *Hjort* (31), fig. 8 ny, fig. 5 og 6 forandret.

- Fig. 5. Næsten fuldt udviklet knop, visende 2 unge knop-anlæg. Disse sees distinkt bestaaende af 2 blærer. (Efter 31, pl. 37, fig. 4). Forstørrelse ca. 140.
- Fig. 6. Ung knop. Forbindelse med moderdyret kun gennem ydre blære, epidermis. Den indre blæres første udviklingsstadier. Dorsalrøret, den sadelformige Pbc. (Efter 31, pl. 37, fig. 2). Forstørrelse ca. 140.
- Fig. 7. Ældre stadium visende peribranchialsækkens og dorsalrørets videre udvikling. (Efter 31, pl. 37, fig. 3). Forstørrelse ca. 140.
- Fig. 8. Ældre stadium, hvor Pbc er løsnet fra forbindelsen med *B-S* og *D-R* fra forbindelsen med Pbc. Illustrerer, dannelsen af gangliet ved fortykkelse af *D-R's* ventrale væg. Ny figur efter senere undersøgelser og med benyttelse af 31, pl. 38, fig. 29. Forstørrelse ca. 140.

Fig. 9—13. *Distaplia magnilarva*.

Cfr. foregaaende afhandling (4).

- Fig. 9. Ung knop, seet fra venstre side, visende den indre blæres første udvikling.
- Fig. 10. Ung knop, samme stadium, seet fra dorsalsiden.
- Fig. 11. Ældre stadium. Dorsalrøret løsnet fra *B-S*. Pbc dannet. Seet fra dorsalsiden.
- Fig. 12. Samme stadium fra venstre side.
- Fig. 13. Gammel knop, viser dorsalrøret paa ældre stadium. Gangliets dannelse.

## Plate IX.

Figs. 1—4. *Perophora Listeri*.

After *Kowalevsky* (37); fig. 1 also given by *Heider* (23).

- Fig. 1. Part of a stolon, showing bud-rudiments by the evagination of the septum of the stolon (*sk*), which, from *Kowalevsky's* description and my own observations, is given as a double lamella (*Kowalevsky*, fig. 1).
- Fig. 2. Young bud, showing the earliest developmental stages of the inner vesicle (*Kowalevsky*, fig. 9).
- Fig. 3. Later stage, but still closely connected with the parent animal. (The latter is not seen in fig. 2, because the bud is viewed from the dorsal side.) Pbc formed by the coalescing of the 2 lateral rudiments. The first indication of the latter is visible in fig. 2 (*Kowalevsky*, fig. 13).
- Fig. 4. Older bud (*Kowalevsky*, fig. 14).

In figs. 3 and 4, the relations of the nervous system (*D-R*) and the peribranchial cavity more clearly represented than by *Kowalevsky*, from personal observations.

Figs. 5—8. *Botryllidæ*.

After *Hjort* (31); fig. 8 new, fig. 5 and 6 altered.

- Fig. 5. Almost fully-developed bud, showing 2 young bud-rudiments. The latter are distinctly seen to consist of 2 vesicles (31, Pl. 37, fig. 4). Magnified about 140 times.
- Fig. 6. Young bud. Communication with the parent animal only through the outer vesicle, the epidermis. Earliest developmental stages of the inner vesicle. Dorsal tube, the saddle-shaped Pbc (31, Pl. 37, fig. 2). Magnified about 140 times.
- Fig. 7. Later stage, showing further development of peribranchial cavity and dorsal tube (31, Pl. 37, fig. 3). Magnified about 140 times.
- Fig. 8. Later stage, where Pbc has broken off connection with *B-S*, and *D-R* with Pbc. Illustrates formation of ganglion with thickening of ventral wall of *D-R*. (New figure from later observations, and employing 31, Pl. 38, fig. 29. Magnified about 140.

Figs. 9—13. *Distaplia magnilarva*.

Cfr. preceding paper (4)

- Fig. 9. Young bud, seen from the left, showing the earliest development of the inner vesicle.
- Fig. 10. Young bud; same stage; dorsal view.
- Fig. 11. Later stage. Dorsal tube detached from *B-S*; Pbc formed. Dorsal view.
- Fig. 12. Same stage, from the left.
- Fig. 13. Old bud, showing later stages of dorsal tube, and formation of ganglion.

## Pl. X.

Fig. 1—5. *Pyrosoma*.

- Fig. 1. Efter *Seeliger* (59, Taf I, fig. 1), ogsaa afbildet af *Heider* (23), visende et moderdyr med stolo, der har 2 Knopper, Kn. (1) og Kn (2).
- Fig. 2. Ungt knopstadium. Nerverørets første dannelse. *Bonnevie* (4).
- Fig. 3. Ung knop, noget ældre end fig. 1. De 2 dorsale epitheltappe til dannelsen af nervesystemet har forenet sig. *Bonnevie* (4).
- Fig. 4 og 5 ældre stadier. *Bonnevie* (4).

Fig. 6—9. *Amaroucium*.

- Fig. 6. Larve af *Amaroucium roseum* visende dannelsen af epicardiet samt nervesystemet. Ny figur.
- Fig. 7. Ungt individ af *Amaroucium* efter *Kowalevsky* (38, Taf. XXXI, fig. 17) visende postabdomen. Ogsaa afbildet af *Heider* (23).
- Fig. 8. Ungt knopskydende individ. Dannelse af knopper ved tverdelinger af postabdomen. Efter *Kowalevsky* (38, Taf. XXXI, fig. 19). Ogsaa afbildet af *Heider* (23).
- Fig. 9. Ungt individ kort efter metamorphosen. Illustrerer epicardiet og nervesystemet, cellulosekappen hos en ung Ascidie.

Fig. 10—12. *Glossophorum sabulosum*.

- Fig. 10. Ung knop set fra venstre side, samme stadium som pl. XI, fig. 1—7. Dannelsen af Pbc og D-R.
- Fig. 11. Ældre stadium. Se speciel beskrivelse.
- Fig. 12. Gammel knop, thoracalpartiet. Dorsalrøret paa overgangen til dannelse af hypophysis og ganglion.

## Pl. XI.

*Glossophorum sabulosum*.

- Fig. 1. Ung knop af samme stadium som pl. X, fig. 10. Dannelse af D-R, Pbc og Epic. De med græske bogstaver betegnede linier viser snitretningen for de i fig. 2—7 afbildede tværsnit. Man erkjender let, at
- Fig. 2 er et tværsnit langs linien  $\alpha-\beta$ .
- Fig. 3 - - - " " "  $\gamma-\delta$ .
- Fig. 4 - - - " " "  $\epsilon-\zeta$ .
- Fig. 5 - - - " " "  $\eta-\theta$ .
- Fig. 6 - - - " " "  $\iota-\lambda$ .
- Fig. 7 - - - " " "  $\lambda-\mu$ .
- Fig. 8—11 viser tværsnit gennem forskellige stadier af gangliets afsnoring fra dorsalrøret.
- Fig. 8. Et stadium, hvor dorsalrørets dorsale væg er sterkt fortykket. Snit længere bagtil af dette stadium viser dorsalrøret som et encellet rør.
- Fig. 9. Begyndende afsnoring af gangliet.

## Plate X.

Figs. 1—5. *Pyrosoma*.

- Fig. 1. After *Seeliger* (59, Pl. I, fig. 1); also given by *Heider* (23); showing a parent animal with stolon which has 2 buds, Kn (1) and Kn (2).
- Fig. 2. Early bud stage. Earliest formation of the nerve tube. *Bonnevie* (4).
- Fig. 3. Young bud, rather older than fig. 1. The 2 dorsal epithelial processes for the formation of the nervous system are united. *Bonnevie* (4).
- Figs. 4 and 5. Later stages. *Bonnevie* (4).

Figs 6—9. *Amaroucium*.

- Fig. 6. Larva of *Amaroucium roseum*, showing the formation of the epicardium and the nervous system. New figure.
- Fig. 7. Young *Amaroucium*, after *Kowalevsky* (38, Pl. XXXI, fig. 17) showing post-abdomen. Also given by *Heider* (23).
- Fig. 8. Young budding animal. Formation of buds by transverse division of post-abdomen. After *Kowalevsky* (38, Pl. XXXI, fig. 19). Also given by *Heider* (23).
- Fig. 9. Young animal soon after metamorphosis; showing the epicardium, cellulose tunic and nervous system in a young Ascidian.

Figs 10—12. *Glossophorum sabulosum*.

- Fig. 10. Young bud, seen from left; same stage as Pl. XI, figs. 1—7. Formation of Pbc and D-R.
- Fig. 11. Later stage. See special description.
- Fig. 12. Old bud, thoracic part. Dorsal tube turning into hypophysis and ganglion.

## Plate XI.

*Glossophorum sabulosum*.

- Fig. 1. Young bud of same stage as Pl. X, fig. 10. Formation of D-R, Pbc and Epic. The lines with Greek lettering show the sectional planes of the transverse sections in figs. 2—7. It will easily be seen that
- Fig. 2 is a transverse section along the line  $\alpha-\beta$ .
- Fig. 3 - - - " " "  $\gamma-\delta$ .
- Fig. 4 - - - " " "  $\epsilon-\zeta$ .
- Fig. 5 - - - " " "  $\eta-\theta$ .
- Fig. 6 - - - " " "  $\iota-\lambda$ .
- Fig. 7 - - - " " "  $\lambda-\mu$ .
- Figs. 8—11 show transverse sections through different stages of the construction of the ganglion from the dorsal tube.
- Fig. 8. A stage in which the dorsal wall of the dorsal tube is much thickened. Sections of this stage further back show the dorsal tube as a single-celled tube.
- Fig. 9. Incipient constriction of the ganglion.



Fig. 10. Ældre stadium.

Fig. 11. Stadium, der i alt væsentligt modsvarer den udviklede knops organisation.

#### Pl. II.

##### Embryonaludviklingen af *Distaplia magnilarva*.

Fig. 1 og 2 af *Heider* (23) efter *v. Davidoff* (12) visende medullarrørets og canalis neurentericus dannelse.

Fig. 3. Ung larve, ikke væsentlig ældre end det i fig. 2 afbildede stadium. Visende medullarrørets første begyndelse til differentiering, samt peribranchialsækkens dannelse.

Fig. 4. Samme stadium i tværsnit. Viser det ene peribranchialsækanlægs forbindelse med ektodermen.

Fig. 5. Ældre stadium seet fra dorsalsiden. De 2 anlæg til peribranchialsækken sammenvoksede og gjællespalterne dannede. Medullarrøret fortil sammenvokset med gjælletarmen.

Fig. 6. Samme stadium seet fra venstre side.

Fig. 7. Repræsenterer den voksne larve. Viser larvehjernens udvikling og forhold til den senere hypophysis, flimmergrube og ganglion. Tidligere afbildet (31), pl. 39, fig. 33.

Fig. 8. Ungt individ med det fastsiddende dyrs bygning. Larvehjernen findes ikke. Gangliet er helt afsnøret. Hypophysen viser sig som en enkel kort cylinder.

Fig. 9. Voksen larve, visende dennes bygning i almindelighed.

Fig. 10. Later stage.

Fig. 11. Stage corresponding in all essential points to the organisation of the developed bud.

#### Plate XII.

##### Embryonic development of *Distaplia magnilarva*.

Figs. 1 and 2. From *Heider* (23) after *v. Davidoff* (12); showing the formation of the medullary tube and the neurenteric canal.

Fig. 3. Young larva, not much older than that in fig. 2, showing the commencement of differentiation in the medullary tube, and the formation of the peribranchial cavity.

Fig. 4. Same stage in transverse section, showing the connection of one rudiment of the peribranchial cavity with the ectoderm.

Fig. 5. Dorsal view of later stage. The 2 rudiments of the peribranchial cavity coalesced, and the branchial stigmata formed. The medullary tube coalesced in front with the branchial gut.

Fig. 6. Left view of same stage.

Fig. 7. Full-grown larva. Shows development of larval brain, and its relation to the subsequent hypophysis, dorsal tubercle and ganglion. Previously given 31, Pl. 39, fig. 33.

Fig. 8. Young animal with the structure of the attached animal. Larval brain not to be found. Ganglion completely constricted. Hypophysis appears as a single short cylinder.

Fig. 9. Full-grown larva, showing general structure.

**Zoologiske Stationer.**  
(Zoological Stations.)

Station No.	Datum. (Date.)	Nordlig Bredde. (North Latitude.)	Længde fra Greenwich. (Longitude.)	Dybde. (Depth)		Engl. Favne. (Fathoms.)	Meter. (Metres)	Bundens Tempe- ratur. (Temperature at Bottom.) C.	Bunden.	Bottom.	Apparat.
											Apparatus.)
											S. Skrabe. (Dredge.) T. Trawl. s. Svabere (Swabs.)
1876											
1	Juni 3	61° 13'	6° 36' E.	650	1189	6.96	Sandler.	Sabulous Clay.	S.		
2	(June) 3	61 10	6 32 E.	672	1229	6.7	Sandler.	Sabulous Clay.	T.		
4	" 8	61 5	5 11 E.	566	1035	6.6	Sandler, Grus, Singel.	Sabulous Clay, Pebbles.	T.		
8	" 9	61 0	4 49 E.	200	366	6.6	Ler, Sand, Sten.	Clay, Sand, Stones.	S.		
9	" 20	61 30	3 37 E.	206	377	5.9	Ler.	Clay.	T.		
10	" 21	61 41	3 19 E.	220	402	6.0	Slik, Ler.	Ooze, Clay.	T.		
18	" 21	62 44	1 48 E.	412	753	1.0	Ler.	Clay.	S. T.		
23	" 23	62 52	5 50 E.						T.		
25	" 28	63 10	5 25 E.	98	179	6.9	Sandler.	Sabulous Clay.	T. S.		
26	" 28	63 10	5 16 E.	237	433	7.1	Sandler.	Sabulous Clay.	S.		
31	" 29	63 10	5 0 E.	117	763	1.0	Sandler.	Sabulous Clay.	S. T.		
33	" 30	63 5	3 0 E.	525	960	—1.1	Ler.	Clay.	T. S.		
34	Juli 1	63 5	0 53 E.	587	1073	1.0	Ler.	Clay.	T.		
35	(July) 5	63 17	1 27 W.	1081	1977	1.0	Biloculinler.	Biloculina Clay.	S.		
40	" 18	63 22	5 29 W.	1215	2222	1.2	Biloculinler.	Biloculina Clay.	S. T.		
48	Aug. 6	64 36	10 22 W.	294	547	0.3	Mørkegraat Ler.	Dark-grey Clay.	s.		
51	" 7	65 53	7 18 W.	1163	2127	1.1	Biloculinler.	Biloculina Clay.	S.		
52	" 8	65 47	3 7 W.	1861	3403	—1.2	Biloculinler.	Biloculina Clay.	T.		
53	" 10	65 13	0 33 E.	1539	2814	—1.3	Biloculinler.	Biloculina Clay.	S & T.		
54	" 12	64 47	4 24 E.	601	1009	1.2	Biloculinler.	Biloculina Clay.	S & T.		
60	" 20	64 40	9 30 E.	118	210	7.0	Haardt Ler.	Hard Clay.	S.		
78	" 21	64 48	6 45 E.	155	283	7.0	Sandler.	Sabulous Clay.	S.		
79	" 21	64 48	6 32 E.	155	283	6.9	Sandler.	Sabulous Clay.	S.		
87	" 22	64 2	5 35 E.	198	911	—1.1	Ler.	Clay.	S.		
92	" 22	64 0	6 42 E.	178	326	7.2	Sandholdigt Ler.	Sabulous Clay.	T.		
93	" 24	62 41	7 8 E.	158	280	6.4	Blødt Ler.	Soft Clay.	T.		
(Romsdalsfjord).											
1877											
96	Juni 16	66 8	3 0 E.	805	1472	—1.1	Biloculinler.	Biloculina Clay.	S.		
101	(June) 17	65 36	8 32 E.	223	408	6.0	Sandler.	Sabulous Clay.	S.		
124	" 19	66 41	6 59 E.	350	640	—0.9	Grovkornet Ler.	Coarse Clay.	S. T.		
137	" 21	67 24	8 58 E.	452	827	—1.0	Ler.	Clay.	S. T.		
147	" 22	66 49	12 8 E.	142	260	6.2	Graat Ler.	Grey Clay.	S.		
149	" 23	67 52	13 58 E.	135	247	4.9	Ler.	Clay.	T. S.		
(Vestfjord).											
164	" 29	68 21	10 40 E.	457	836	—0.7	Sandler.	Sabulous Clay.	S. T.		
175	Juli 2	69 17	14 35 E.	415	759	3.0	Sand. Stene.	Sand, Stones.	S.		
176	(July) 3	69 18	14 33 E.	536	980	—0.2	Ler.	Clay.	S.		
177	" 3	69 25	13 49 E.	1443	2639	1.2	Biloculinler.	Biloculina Clay.	S & T.		
183	" 5	69 59	6 15 E.	1710	3127	—1.3	Biloculinler.	Biloculina Clay.	S & T.		
190	" 7	69 41	15 51 E.	870	1591	1.2	Sandholdigt Ler.	Sabulous Clay.	T.		
192	" 7	69 46	16 15 E.	649	1187	0.7	Sandler.	Sabulous Clay.	S.		
195	" 16	70 55	18 38 E.	107	196	5.1	Sten, Ler.	Stones, Clay.	S.		
200	" 17	71 25	15 41 E.	620	1134	—1.0	Ler.	Clay.	S. T.		
205	" 18	70 51	13 3 E.	1287	2354	—1.2	Biloculinler.	Biloculina Clay.	S.		
213	" 26	70 23	2 30 E.	1760	3219	—1.2	Biloculinler.	Biloculina Clay.	S.		
223	Aug. 1	70 54	8 24 W.	70	128	—0.6	Graasort Sandler.	Dark-grey sabulous Clay	S.		
(Jan Mayen).											
224	" 1	70 51	8 20 W.	95	174	—0.6	Graasort Sandler.	Dark-grey sabulous Clay	S.		
225	" 2	70 58	8 4 W.	195	357	0.6	Graasort Sandler.	Dark-grey sabulous Clay	S.		
226	" 2	70 59	7 51 W.	340	622	—0.6	Sort Sand og Ler.	Black Sand and Clay.	S.		
237	" 3	70 41	10 10 W.	263	481	—0.3	Brunt Ler, Stene.	Brown Clay, Stones.	S.		
240	" 4	69 2	11 26 W.	1004	1830	—1.1	Biloculinler.	Biloculina Clay.	S.		

Station No.	Datum. (Date)	Nordlig Bredde. (North Latitude.)	Længde fra Greenwich. (Longitude.)	Dybde. (Depth.)		Bundens Temperatur. (Temperature at Bottom.) C.	Bunden.	Bottom.	Apparat. (Apparatus.) S. Skrabe. (Dredge.) T. Trawl. S. Svabere. (Swabs.)
				Engl. Favne. (Fathoms.)	Meter. (Metres.)				
248	Aug. 8	67 56	4 11 E.	778	1423	-1.04	Biloculinler.	Biloculina Clay.	S.
251	" 9	68 6	9 44 E.	634	1159	-1.3	Ler.	Clay.	S.
252	" 11	Vestfjord.					Ler.	Clay.	S.
253	" 15	Skjerstadfjord.		263	481	3.2	Ler.	Clay.	S.
253b	" 17	Saltstrømmen.		90	165		Sten.	Stones.	S.
255	1878. Juni 19	68° 12'	15° 40' E.	341	624	6.5	Ler.	Clay.	S.
257	(June) 21	70 4	23 2 E.	160	293	3.9	Ler.	Clay.	S.
258	" 21	70 13	23 3 E.	230	421	4.0	Ler.	Clay.	T.
260	" 24	70 55	26 11 E.	127	232	3.5	Ler.	Clay.	S. T.
261	" 25	70 47	28 30 E.	127	232	2.8	Ler.	Clay.	S. T.
262	" 27	70 36	32 35 E.	148	271	1.9	Ler.	Clay.	T. S.
267	" 29	71 42	37 1 E.	148	271	-1.4	Ler, Sten.	Clay, Stones.	S.
270	" 30	72 27	35 1 E.	136	249	-0.0	Ler.	Clay.	S.
273	Juli 1	73 25	31 30 E.	197	360	2.2	Ler.	Clay.	S.
275	(July) 2	74 8	31 12 E.	147	269	-0.4	Ler.	Clay.	T.
280	" 4	74 10	18 51 E.	35	64	1.1	Sten.	Stones.	S.
283	" 5	73 47	14 21 E.	767	1403	-1.4	Ler.	Clay.	S.
286	" 6	72 57	14 32 E.	447	817	-0.8	Ler.	Clay.	T.
290	" 7	72 27	20 51 E.	191	349	3.5	Sandler.	Sabulous Clay.	T.
295	" 14	71 59	11 40 E.	1110	2030	-1.3	Biloculinler.	Biloculina Clay.	T.
297	" 16	72 36	5 12 E.	1280	2341	-1.4	Biloculinler.	Biloculina Clay.	T.
303	" 19	75 12	3 2 E.	1200	2195	-1.6	Biloculinler.	Biloculina Clay.	T.
312	" 22	74 54	14 53 E.	658	1203	-1.2	Ler.	Clay.	T.
315	" 22	74 53	15 55 E.	180	329	2.5	Ler, Sand.	Clay, Sand.	T.
322	" 23	74 57	19 52 E.	21	38	0.2	Haard.	Hard.	S.
323	" 30	72 53	21 51 E.	223	408	1.5	Ler.	Clay.	T.
326	Aug. 3	75 31	17 50 E.	123	225	1.6	Ler.	Clay.	T.
333	" 4	76 6	13 10 E.	748	1368	-1.3	Biloculinler.	Biloculina Clay.	T.
336	" 5	76 19	15 42 E.	70	128	0.4	Ler, Haard B.	Clay, Hard Bottom.	S.
338	" 6	76 16	17 49 E.	146	267	-1.1	Sten.	Rock	S.
343	" 7	76 34	12 51 E.	743	1359	-1.2	Ler.	Clay.	T.
350	" 8	76 26	0 29 W.	1686	3083	-1.5	Biloculinler.	Biloculina Clay.	T.
353	" 10	77 58	5 10 E.	1333	2438	-1.4	Biloculinler.	Biloculina Clay.	T.
357	" 12	78 3	11 18 E.	125	229	1.9	Ler.	Clay.	S.
359	" 12	78 2	9 25 E.	416	761	0.8	Ler.	Clay.	S.
362	" 14	79 59	5 40 E.	459	839	-1.0	Ler.	Clay.	T.
363	" 14	80 3	8 28 E.	260	475	1.1	Ler.	Clay.	T.
366	" 17	79 35	11 17 E.	61	112	-2.1	Ler.	Clay.	T.
"	"	Magdalene Bay.		37	68	-0.2			
370	" 18	78 48	8 37 E.	109	199	1.1	Ler.	Clay.	T.
372	" 19	78 9	14 7 E.	129	236	1.2	Ler.	Clay.	T.
374	" 22	78 16	15 33 E.	60	110	0.7	Ler.	Clay.	T.
		(Advent Bay).							



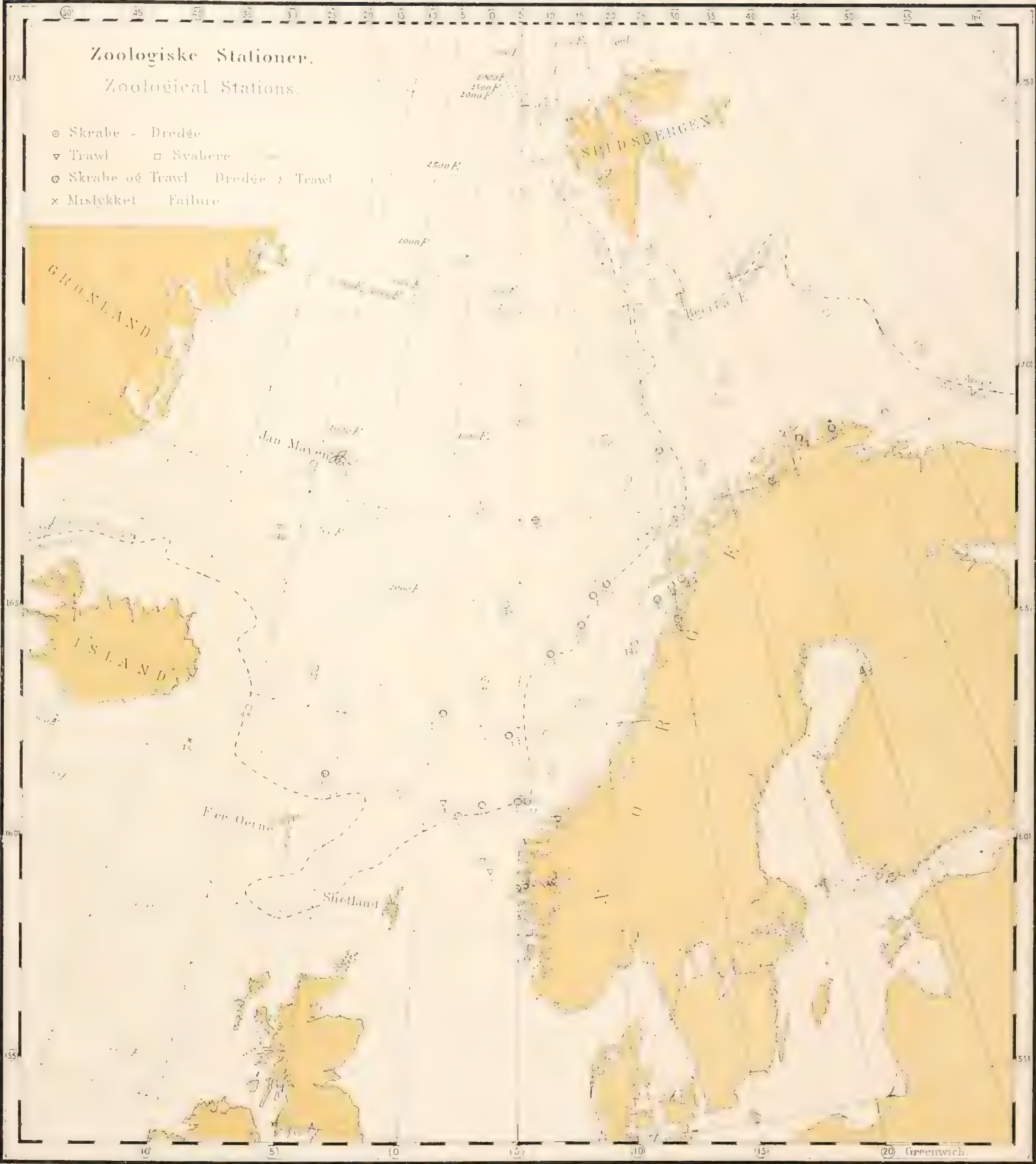






















Fig 32 et Fig 36 G.O. Sars del. Fig. 19, 26, 27, 28, 35 Bergh del. Fig. 20-25, 29-31 33 34 37 Bonnevie del.







*Fig. 1-2, Ascidia venosa, O.F. Müll. Fig. 3-7, Molgula arctica, nov. sp.*  
*Fig. 8-12, Molgula norvegica nov. sp. Fig. 13-15, Eugyra translucida nov. sp.*  
*Fig. 16-19, Paramolgula rara, nov. sp.*











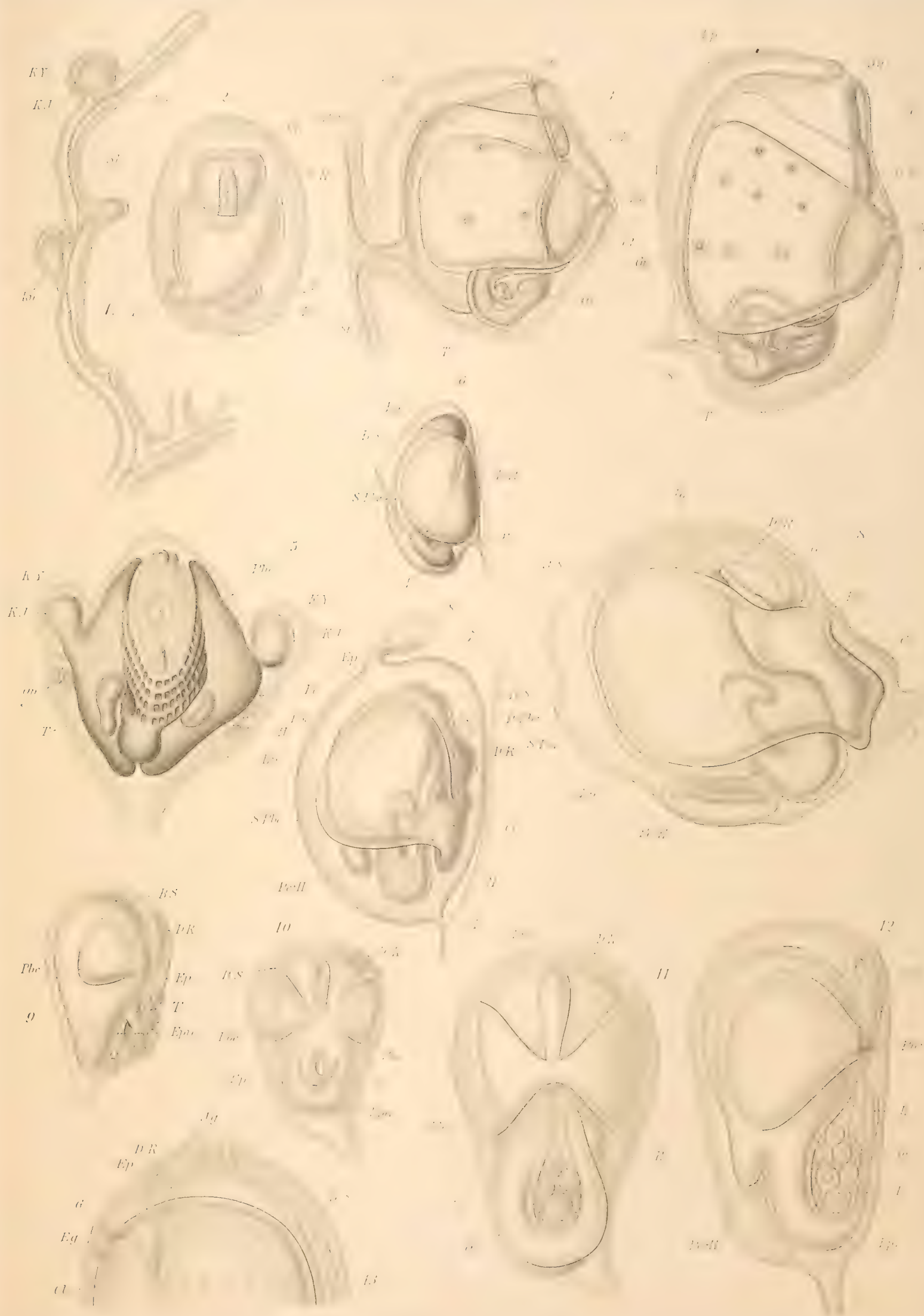




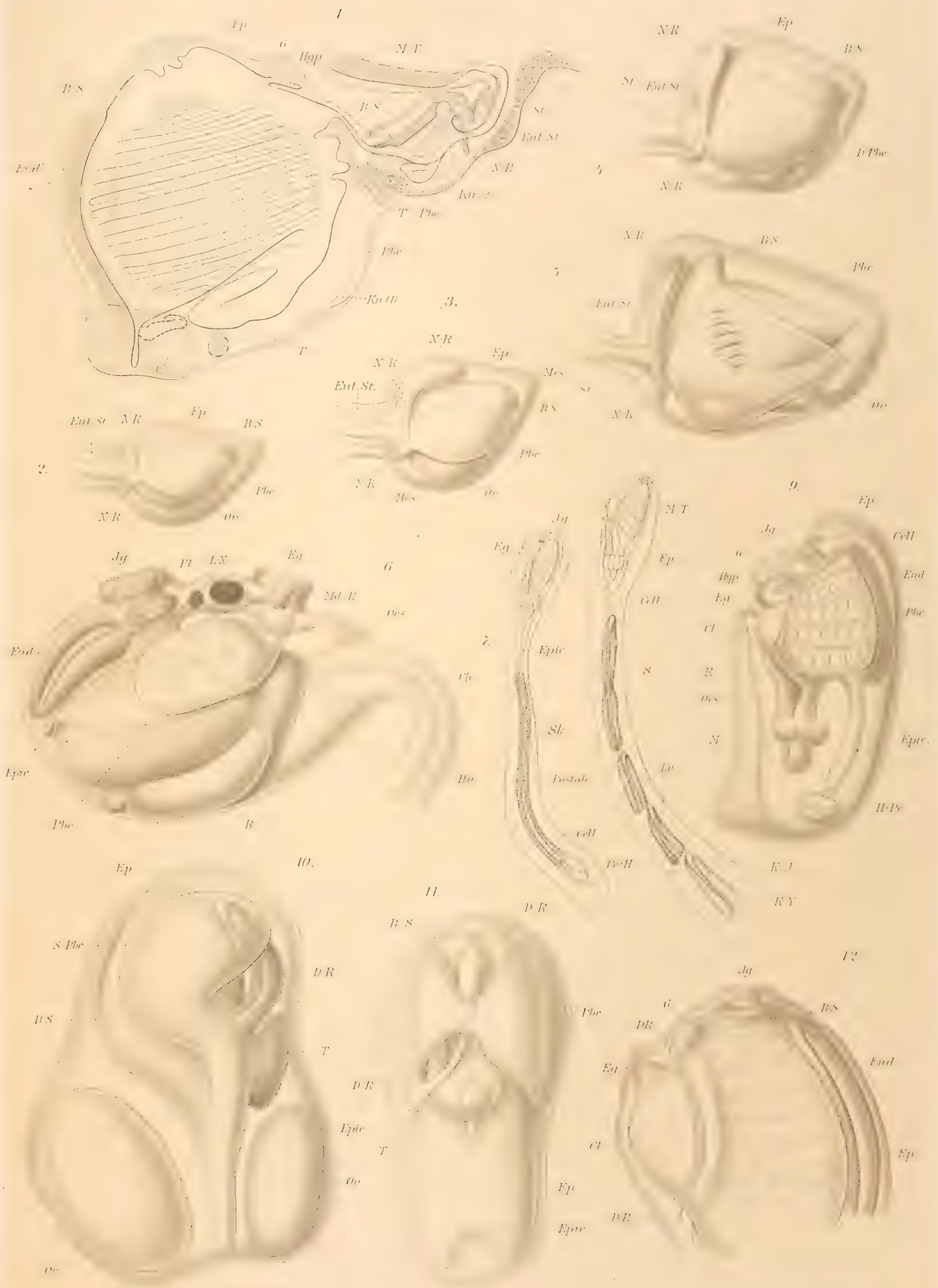






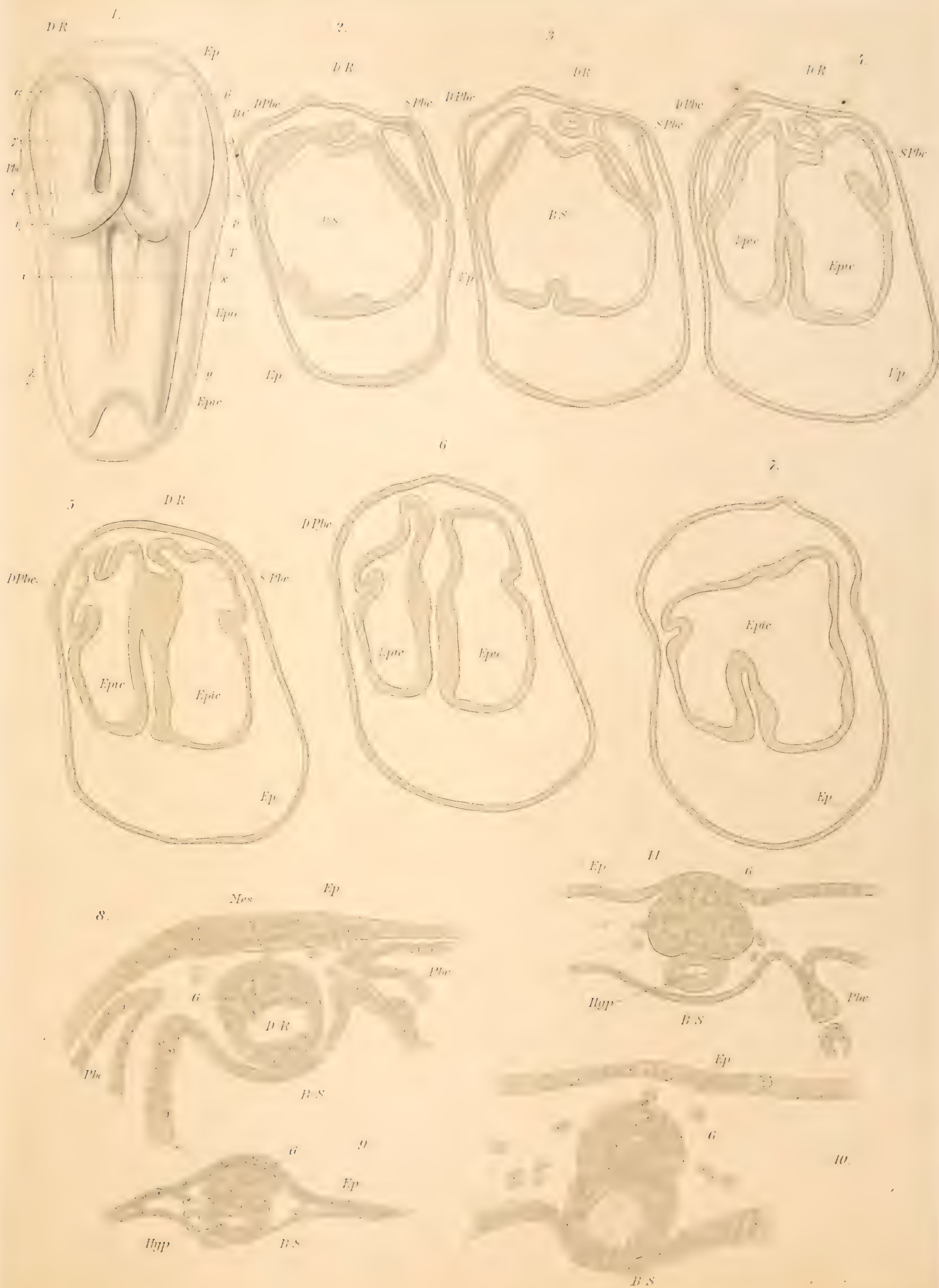






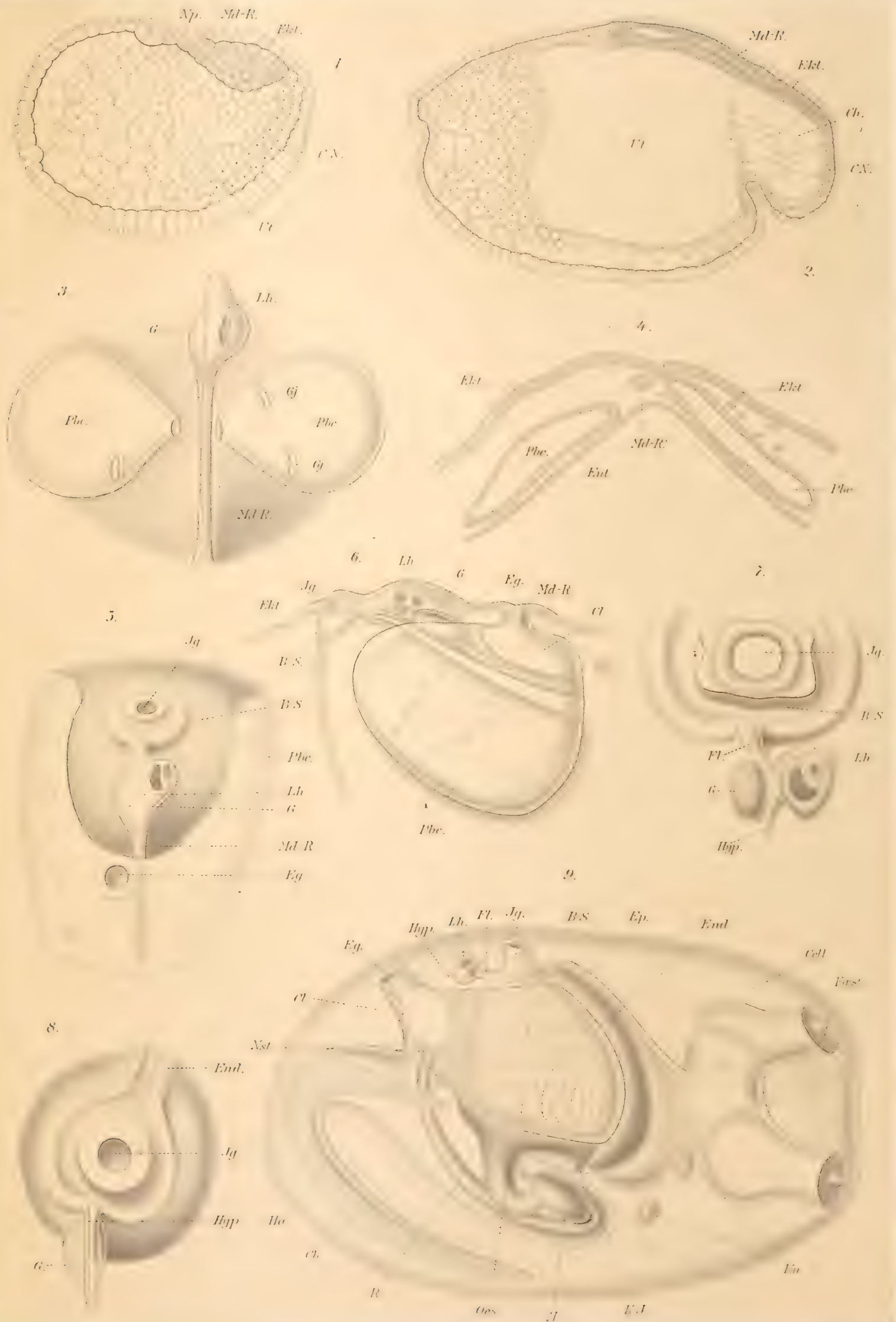


















DEN NORSKE NORDHAVS-EXPEDITION  
1876—1878.

# ZOOLOGI.

## HYDROIDA.

AF

KRISTINE BONNEVIE.

MED 3 FIGURER, 8 TAVLER OG 1 KART.



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CHRISTIANIA.  
GRØNDAHL & SØNS BOGTRYKKERI.  
—  
1899.

THE NORWEGIAN NORTH-ATLANTIC EXPEDITION  
1876—1878.

ZOOLOGY.

HYDROIDA.

OF

KRISTINE BONNEVIE.

WITH 3 FIGURES, 8 PLATES & 1 MAP.



---

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PRINTED BY GRØNDAHL & SØN.  
1899.







## F o r o d.

Manuskriptet til'denne Afhandling blev leveret fra min Haand allerede i November 1898, og et helt Aar er saaledes gaaet med til Oversættelse (denne var færdig i Marts 1899) og Trykning. Heri maa Grunden søges, naar jeg ikke har kunnet tage det tilborlige Hensyn til den allernyeste Literatur; en Fortegnelse over den findes dog hosføiet den alm. Literaturfortegnelse Pag. 100.

Hvad angaar Ordningen og Brugen af de systematiske Tabeller, hvoraf der findes en for hver Genus af de nordiske Hydroider, bedes følgende bemærket:

Ved Læsning af Tabellen fra venstre finder man først saadanne — ofte løsrevne — Kjendemerker, der specielt er af Betydning for Artsbestemmelsen, medens en mere udfyldende Beskrivelse af alle Arternes Eiendommeligheder findes paa høire Side af deres Navne. De Tal, der staar hosføiet Arternes Navne, henviser til de tilsvarende Numre i Literaturfortegnelsen bag i Bogen.

*Kristiania, 2den November 1899.*

**Kristine Bonnevie.**

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## P r e f a c e.

The MS of this treatise was completed in November, 1898, and thus a whole year has been taken up with the translating (which was finished in March 1899) and the printing. This must be taken as the explanation of the fact that I have not taken proper notice of the latest literature on the subject. A list of this will, however, be found added to the general bibliography, p. 100.

With regard to the use of the systematic tables, of which there is one for each genus of Scandinavian hydroids, the following remark may be made:

On reading the table, there is first found, to the left, such distinguishing features — often disconnected — as are of special importance in determining the species; while a fuller description of all the peculiarities of the species is found to the right of their names. The figures after the names of the species refer to the corresponding numbers in the bibliography at the end.

*Kristiania, 2nd Nov. 1899.*

**Kristine Bonnevie.**

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## Hydroida.

I Vaaren 1896 blev det mig overdraget at undersøge Hydroidematerialet fra Den norske Nordhavsekspe-  
dition, og jeg tillader mig herved at frembære min ærbødige Tak til Redaktionskomiteen, de Herrer, Professorerne *Mohn* og *G. O. Sars*, fordi dette interessante Hverv blev mig anbetroet.

Materialet indeholder 45 Arter, hvoraf 16 er nye for Videnskaben; og deriblandt er flere Former, hvis Anatomi er af stor Interesse, og som tildels kommer til at have Indvirkning paa Opfatningen af Hydroidernes Systematik. For at faa Anledning til at sætte mig grundig ind i de tidligere kjendte Formers Bygning, og derigjennem sættes istand til at faa et selvstændigt Syn paa Sammenhængen mellem Arterne og paa Grundlaget for Systematiken, har jeg faaet overladt til Undersøgelse Hydroidesamlingerne fra Kristiania Universitet og fra Tromsø Museum, ligesom jeg ogsaa har gennemgaaet private Samlinger fra Konservator *Appelløf* og Kand. *Nordgaard* i Bergen. Jeg tillader mig herved at rette en Tak til de nævnte Herrer og til Samlingsbestyrerne Prof. *R. Collett* i Kristiania og Konservator *Sparre-Schneider* i Tromsø, for den Hjælp de gennem sit værdifulde Materiale har ydet mig under mit Arbeide med Hydroiderne. Specielt har Samlingen i Kristiania været mig af stor Nytte, da den indbefatter alle de af Prof. *M.* og *G. O. Sars* fundne Hydroider og saaledes ogsaa Original-exemplarerne for de mange Beskrivelser af nye Arter, som de begge har leveret. Herigjennem er jeg sat istand til, dels paa enkelte Punkter at supplere disse Beskrivelser, og dels at klargjøre Tvivlsspørgsmaal, der senere er opstaaede dem angaaende.

Mit Materiale har tilsammen omfattet 5—600 Exemplarer af Hydroider, der kan henføres til ca. 150 Arter, og jeg antager, at det repræsenterer saagodtsom alle Norges Hydroider, idet Universitetets Samling indbefatter Arter fra hele Landets Kyststrækning, medens af de tidligere nævnte Specialsamlinger, *Appelløfs* er fra Bergenskanten, *Nordgaards* fra Lofoten og Egnen omkring Nordkap og *Tromsø* Museums fra dette Sted.

## Hydroida.

In the spring of 1896, I was commissioned to examine the collection of Hydroids from the Norwegian North Atlantic Expedition; and I here beg to offer my grateful thanks to the editorial committee, *Professors Mohn and G. O. Sars*, for having entrusted this interesting task to me.

The collection comprises 45 species, of which 16 are new to science; and among them are several forms whose anatomy is of great interest, and which will, to some extent, affect the present views with regard to the systematisation of hydroids. In order to become thoroughly acquainted with the construction of the forms already known, and thus be enabled to look with an unprejudiced eye at the affinity between the species, and on the foundation for the systematisation, I obtained permission to examine the collections of hydroids from the Kristiania University and from Tromsø Museum, and I have also gone through the private collections of *Curator Appelløf* and *Hr. Nordgaard* in Bergen. I beg here to tender my thanks to these gentlemen, and to *Prof. R. Collett* and *Curator Sparre-Schneider*, the respective directors of the Kristiania and Tromsø collections, for the help they through their valuable material have given me in my work. The collection in Kristiania, in particular, has been of great use to me, as it comprises all the hydroids found by *Professors M. and G. O. Sars*, and thus the original specimens for the numerous descriptions of new species which they have furnished. By this means, I have been enabled, partly to supplement these descriptions in certain points, and partly to elucidate doubtful questions which have subsequently arisen concerning them.

The material which I had to work upon contained, in all, between 500 and 600 specimens of Hydroids, referable to about 150 species; and I imagine that it includes representatives of very nearly all the hydroids of Norway, as the University collection contains hydroids from the entire line of coast, while the previously-mentioned private collections, *Appelløfs* and *Nordgaard's*, are respectively from the Bergen district and from Lofoten and the region round the North Cape, and that of the Tromsø Museum from Tromsø.

Desuden har jeg i de sidst forløbne Somre under Ophold ved Krstianiafjorden, paa forskjellige Steder af Vestlandet, i Lofoten og ved Trondhjemsfjorden havt Anledning til selv at studere Hydroidefaunaen paa levende Individer, og at iagttage de i Planktonet levende Meduser.

For at faa indordnet Nordhavsexpeditionens Hydroider paa sine Pladse i det System, der efter mine Undersøgelser staar for mig som det naturlige, har jeg for hver Slægt opstillet et Schema, der omfatter disse, sammenstillet med Norges Hydroider, der dels er kjendte fra før af som norske, dels nye for vor Fauna og dels er de ikke tidligere beskrevne.<sup>1</sup>

### Bemærkninger om den senere Tids Literatur, og om Grundlaget for et naturligt System.

*Hincks* og *Allman* har i sine klassiske Verker — (57) 1868 og (14) 1872, — givet en en Oversigt over den ældre Hydroideliteratur, og sat dens Resultater i System, hvorved de i hoi Grad har lettet Arbeidet for de senere Forskere.

Men efter denne Tid er Kjendskabet til Hydroiderne blevet sterkt udvidet, idet der er udkommet en stor Mængde Afhandlinger med Beskrivelser af nye Slægter og Arter fra de forskjellige Steder. Ofte mangler enhver Angivelse af det System, hvorunder Forfatteren tænker sig Arterne indordnede, — *Allman* har selv (19) forladt sit tidligere System og oprettet et nyt, der er i hoi Grad unaturligt, ligesom han har oprettet en Række nye Slægter, hvoraf de fleste er baseret kun paa Artskarakterer — og Hydroidernes Systematik var saaledes bleven sterkt kompliceret, paa samme Tid som Literaturen, bestaaende af talrige spredte Afhandlinger, var meget vanskelig at overskue. En Revision var derfor hoist paakrævet, og i de sidste Aar er der da ogsaa gjort kraftige Skridt i Retning af en Forenkling af Systemet.

*Levinsen* (79) gjorde i 1893 Begyndelsen, idet han, foruden at give meget interessante Meddelelser angaaende enkelte Punkter af af Hydroidernes Anatomi, ogsaa sammenfattede en Del ældre Familier under Fam. *Bougainvillidae*, og forøvrigt gav temmelig omfattende Diagnoser af flere andre Familier. Han hævder, at man under Slægtsinddelingen ikke kan tage Hensyn til, hvorvidt Gonoforerne udvikler sig til fri Meduser eller ikke, og dette gennemfører han i Systemet paa en enkelt Undtagelse nær (nemlig hvor han retter sig efter den almindelige Praksis, og foreslaar Navnet *Halisiphonia* for saadanne Lafoëa-Arter, der frembringer Meduser). Men paa samme Tid som han saaledes indleder en Forenkling af Systemet, saa opretter han selv under *Campanulinidae* en Række nye Slægter, der efter min Opfatning ikke har Existensberettigelse som saadanne; de er nemlig grundede paa Kjendemerker, der er meget gode for Artsbestemmelsen, men som dog neppe kan

I have, moreover, during the last few summers on the Kristiania Fjord, in various places on the west coast, in Lofoten and on the Trondhjem Fjord, had occasion of studying the hydroid fauna from living specimens, and of observing the medusæ living in the plankton.

In order to give the hydroids of the North Atlantic Expedition their proper place in the system which after my investigations, seems to me, to be the natural one, I have drawn up a table for each genus, in which they are placed side by side with Norwegian hydroids, some of them being already known as Norwegian, some new to our fauna, and some not previously described.<sup>1</sup>

### Remarks on the literature of recent times, and on the foundation for a natural system.

*Hincks* and *Allman*, in their works — (57) 1868 and (14) 1872 — have given a general view of the earlier hydroid literature, and systematised its results, thereby greatly lightening the labour of subsequent investigators.

But since that time, the knowledge concerning hydroids has been greatly extended, a great number of treatises having appeared with descriptions of new genera and species from the most varied localities. Frequently all mention of the system according to which the author places the species is wanting — *Allman* himself (19) abandoned his previous system, and set up a new one which is extremely unnatural; and he has also established a series of new genera, the greater number of which are based only upon specific characters — and the systematisation of the Hydroida had thus become highly complicated, while at the same time the literature, consisting of numerous scattered treatises, was very difficult to survey. A revision was thus extremely needful, and of late years decided steps have been taken in the direction of a simplification of the system.

*Levinsen* (79) made a commencement in 1893, when, besides imparting very interesting information concerning certain points in the anatomy of hydroids, he collected a number of older families under the family *Bougainvillidae*, and also gave fairly comprehensive definitions of several other families. He maintains that in dividing into genera, no regard can be paid to the question whether the gonophores develop into medusa or not, and he carries this out in his system (with one exception, viz. where he conforms to the general practice, and proposes the name *Halisiphonia* for such species of *Lafoëa* as produce medusæ). But while thus introducing a simplification of the system, he himself establishes, under *Campanulinidae*, a series of new genera, whose existence as such is, in my opinion, without justification, for they are founded on distinguishing features which are good enough for determining species, but which can scarcely have the importance which *Levinsen*

<sup>1</sup> En Beskrivelse af disse nye norske Arter fremkommer i Bergens Museums Aarvog for 1898 i en Afhandling, der sendes i Trykken samtidig med denne.

<sup>1</sup> A description of these new Norwegian species will appear in the Year-book of the Bergen Museum for 1898, in a paper which goes to press at the same time as the present one.



have den Betydning, Levinsen tillægger dem, da alle disse Slægter — ligeoverfor andre nærstaaende — dog staar som et samlet Hele.

Under Undersøgelsen af Nordhavsexpeditionens athecate Hydroider, blev jeg fuldstændig overbevist om, — hvad *Levinsen* ogsaa havde fremhævet — at Spørgsmaalet om Gonoforerens Udvikling er fuldstændig betydningsløst for Systematiken, idet der blandt meget nærstaaende Arter, stadig findes saadanne, hvis Gonoforer sammen danner en mere eller mindre tæt sluttet Række af Udviklingstrin — fra Gonofor uden Radialkanaler og op til fri Meduser med fuldstændigt Kanalsystem. — En anden Sag er det, at saadanne Arter bør skilles ud, hvis Gonoforer er byggede efter et Princip, forskjelligt fra det, som er Grundlaget for Medusebygningen.

Denne min Opfatning fremholdt jeg (29) i min forelobige Meddelelse om de athecate Hydroider. Desværre fik jeg ikke, førend Korrekturlæsningen paa denne var besorget, fat i *Schneiders* Afhandling (107), der var udkommet lige før mit Manuskript gik i Trykken, og jeg kunde saaledes ikke referere til denne. Forfatteren giver her i korte Træk en Fremstilling af Hydroidernes Systematik, og han gennemfører konsekvent det ovenfor omtalte Princip samtidig med at han ogsaa paa andre Maader stadig arbejder for en Forenkling af Systemet. Han fremholder, at alle Arter danner en sluttet Række, og kun derved, at enkelte Arter er uddøde, andre endnu ukjendte, viser der sig for os større og mindre Huller i denne Række; og saalænge disse Huller eksisterer, og enkelte Arter derfor synes adskilt ved et Sprang i Rækken, maa disse henføres til forskjellige Slægter, der imidlertid smelter sammen, eftersom Overgangsformer mellem dem opdages. Med denne Tanke som Udgangspunkt gennemgaar han saa de tidligere opstillede Slægter og reducerer den største Del af dem til Synonymer.

Det System af Slægter, som da tilslut opstilledes af *Schneider*, forekommer mig at være bygget paa en naturlig Sammenhæng mellem Arterne, og jeg maa i alt væsentligt give det min Tilslutning<sup>1</sup>; og hvis Fremtidens Systematikere under sit Arbejde vilde have Blikket rettet paa Overensstemmelsen mellem Arterne, lige meget som paa Forskjellen mellem dem, da kunde der muligens være Haab om efterhaanden at blive af med den Hær af Synonymer, der nu i saa høj Grad vanskeliggjør enhver systematisk Undersøgelse af Hydroiderne.

Men hvis man paa den anden Side gaar for vidt i dette Forenklingsarbejde, og f. Eks. forener til en Slægt alle Arter, mellem hvilke man kan finde Overgangsformer, da bliver jo Følgen kun den, at de gamle Benævnelser, Familie, Slægt o. s. v., lidt efter lidt glider ud af Systemet, eller iallefald træder ud af Brug, medens man af praktiske Hensyn maa indføre andre for at betegne nærmere og fjernere Sammenhæng mellem Arterne indenfor en og samme Slægt. Og det er jo forholdsvis ligegyldigt om de forskjellige

attributes to them, as all these genera — compared with other nearly-allied genera — are like one complete whole.

During my examination of the N. Atl. Exp. athecate hydroids, I became fully convinced of what *Levinsen* had also asserted, viz. that the question as to the development of the gonophores is of no importance whatever to the systematisation, as among nearlyallied species there are always some whose gonophores form together a more or less complete series of developmental stages, from gonophores without radial canals, up to free-swimming medusæ with a complete canal system. Another question it is that species, whose gonophores are constructed on a principle different to that which forms the basis of the medusa construction, ought to be separated from the others.

I put forward this view in my preliminary communication (29) relating to the athecate hydroids. Unfortunately, *Schneider's* treatise (107), which had appeared just before my MS went to press, did not fall into my hands until after my proofs had been read, and I was thus unable to refer to it. The author there gives a brief statement of the systematisation of hydroids, and he consistently carries out the above-mentioned principle, while at the same time he is in other direction too striving towards a simplification of the system. He maintains that all species form a compact series, and that it is only because some species have died out, and others are still unknown, that we see large or small gaps in the series; and as long as these gaps exist, and certain species, in consequence, seem to be separated by a break in the series, they must be referred to different genera, which, however, merge together, as the transition-forms between them are discovered. Starting with this idea, he then goes through the previously-established genera, and reduces the greater number of them to synonyms.

The system of genera which is finally drawn up by *Schneider* seems to me to be built upon a natural connection between the species, and in all essentials, I must give it my adherence.<sup>1</sup> If the systematists of the future, during their labours, would turn their attention to the similarity between the species as much as to the difference between them, there would perhaps be some hope of getting gradually rid of the host of synonyms which now so greatly add to the difficulty of a systematic investigation of the Hydroida.

But if, on the other hand, this work of simplifying is carried too far, and one genus, for instance, is presented with all the species between which transition forms may be found, the consequence will be that the old names — family, genus, etc. — gradually drop out of the system, or at any rate out of use, while for practical considerations others must be introduced to designate the close or distant connection between the species in a genus. It is indeed a matter of comparative indifference whether the various

<sup>1</sup> Hvor min Opfatning i Enkeltheder afviger fra *Schneiders*, vil det blive omtalt nedenfor.

<sup>1</sup> Where my opinion differs from *Schneider's* in details, it will be mentioned below.

Grupper i et System benævnes Familier, Slægter, Under-slægter eller hvad man nu vil kalde dem; Hovedsagen er, at det Princip, efter hvilket Systemet er bygget, gennemføres konsekvent, saa at man over hele Linien benytter ligeværdige Kjendemerker til at karakterisere sideordnede Grupper.

Naar man betragter Rækken af de forskellige Hydroidfamilier og Slægter, ser man hos dem en Udvikling fra Ensartethed til mere eller mindre sterkt udviklet Differentiation, paa samme Maade som man træffer den overalt ellers saavel under den ontogenetiske som phylogenetiske Udvikling.

Hos Hydroiderne ytrer denne Differentiering sig mest paaafaldende ved Generationsstoffernes (Gonoforerne) Plads i Kolonien. Betragter man f. Eks., med *Clava* som Udgangspunkt, de athecate Hydroider, der har spindelformige Hydranther med traadformige Tentakler, da finder man her repræsenteret alle de forskellige Trin i en saadan Udvikling. Alle Hydranther i Koloni af *Clava* bærer Gonoforer; der er altsaa inden Kolonien fuld Ensartethed, og det samme finder man hos *Perigonimus*, hvor Gonoforerne findes spredt over Stamme og Grene i hele Kolonien. *Bougainvillidae* viser os et noget høiere Udviklingstrin, idet her Gonoforerne findes samlede paa enkelte Hydranthers Stilke, medens Kolonien forresten er steril. (Første Anlæg til Blastostyldannelse). Hos *Dicoryne* og hos *Hydractinia* er Blastostyldannelsen fuldstændig, idet de Hydranther, der bærer Gonoforerne, er mere eller mindre atrophierede, og saaledes ikke længer staar i Ernæringens Tjeneste.

Herfra kommer man saa over til de thecaphore Hydroider, hos hvilke den atrophierede Hydranth og de paa den siddende Gonoforer, yderligere er udpræget som en Enhed derved, at de er bedækkede af et fælles Chitinhylster.

Ved at gaa ud fra *Coryne* og betragte de Familier, der maa afledes fra denne, ser man samme Udvikling, men her med store Sprang. I denne Række ser man Differentieringen endnu videre fremskreden, end hos *Hydractinia*, idet Blastostylerne (de atrophierede Hydranther) fuldstændig omdannes og fra at repræsentere Individuer i en Koloni, gaar de over til at være Organer paa et Individ. Denne Forandring indledes hos *Myriothela*, hvor Blastostylerne, der fuldstændig ligner dem, man finder hos *Hydractinia*, har sin Plads paa den nederste Del af Koloniens eneste ikke atrophierede Hydranth. Og hos *Tubularia* findes den i sin høieste Udvikling, idet Blastostylerne, der neppe kan gjenkjendes som saadanne, sidder som Kreds af klaseliggende Organer indenfor Hydrantiens proximale Tentakelkreds.

Jeg, tror, at denne Differentiering indenfor Kolonien er en god Ledesnor ved Gruppering af Hydroiderne. *Allman* har flere Steder benyttet den, idet han har skilt fra hinanden Arter med og uden Blastostyldannelse; men da dette kun staar som et af de mange ofte høist uvæsentlige Kjendemerker i Arternes Bygning, der danner Grundlaget for hans nye Slægter, faar man ikke Indtryk af at han

groups in a system are called families, genera, subfamilies, or by any other name; the main thing is that the principle upon which the system is built is carried out consistently, so that, in every case, distinguishing marks of equal value are employed in characterising co-ordinate groups.

On looking at the series of the various hydroid families and genera, there is seen to be a development from homogeneity to a more or less highly-developed differentiation, similar to that which it universally met with during both ontogenetic and phylogenetic development.

In the hydroids, this differentiation is most noticeably expressed in the position of the generative products (gonophores) in the colony. If, for instance, with *Clava* as our point of departure, we look at those athecate hydroids which have spindles haped hydranths with filiform tentacles, we find represented there all the different stages in a development of this description. All the hydranths in a colony of *Clava* bear gonophores; there is thus complete homogeneity within the colony, and the same is the case with *Perigonimus*, where the gonophores are found scattered over stems and branches throughout the colony. *Bougainvillia* presents a somewhat higher stage of development, the gonophores being congregated on the stems of a few hydranths, while the rest of the colony is sterile. (Earliest commencement of blastostyle formation). In *Dicoryne* and *Hydractinia*, the blastostyle formation is complete, as those hydrants which bear the gonophores are more or less atrophied, and are thus no longer employed in the service of nutrition.

From these we come to the thecaphore hydroids, where the unity of the atrophied hydranth and its gonophores is yet more distinctly emphasised by their being covered with a common chitinous sheath.

Starting from *Coryne*, and looking at the families that must be derived from it, we see the same development, but with greater breaks. In this series, the differentiation is found to be yet farther advanced than in *Hydractinia*, the blastostyles (atrophied hydrants) being completely transformed, and from representing persons in a colony, have become organs in a person. This change is introduced in *Myriothela*, where the blastostyles, which exactly resemble those in *Hydractinia*, are found on the lower part of the only unatrophied hydranth in the colony. In *Tubularia* it is found at its highest degree of development, the blastostyles, which are scarcely recognisable as such, being placed like a circle of raceme-like organs within the hydranth's proximal crown of tentacles.

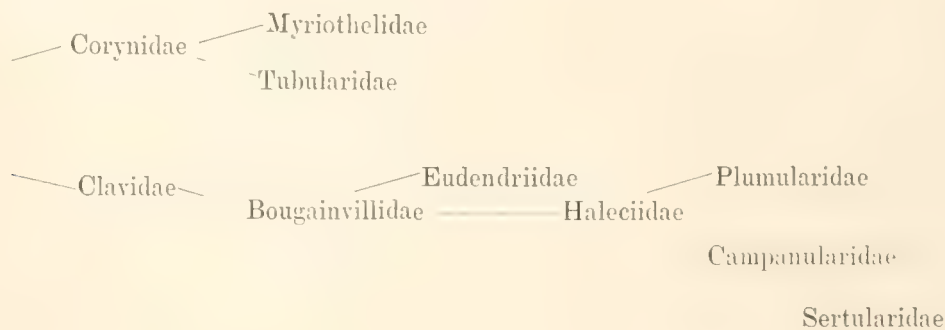
I think this differentiating within the colony is a good guide in the grouping of hydroids. *Allman* has employed it in several places, separating from one another species with and without blastostyle formation; but as this is only one of many, often extremely unimportant, distinguishing features in the structure of the species that form the foundation for his new genera, it does not appear that



har tillagt dette nogen større Betydning. Merkelig nok er Udviklingen af Blastostylerne ellers ikke taget i Betragtning i Systematiken, og jeg vil derfor ikke undlade at gjøre opmærksom paa den som paa en Rettesnor, der efter min Opfatning maa lede til Bygningen af et naturligt System.

De forskjellige Familiers Afstamning i dette System tænker jeg mig saaledes, som antydnet i Fig. 1.

Fig. 1.



*Schneider* har gjort opmærksom paa det unaturlige i at stille *Clavidae* som Udgangspunkt for alle de athecate Hydroider, (hvad tidligere altid har været gjort). *Corynidae*, der har kolleformede Tentakler kan neppe stamme fra Arter med traadformede, da Udviklingen af Tentaklerne andensteds i Systemet gaar i den modsatte Retning (Overgang fra *Coryne* til *Pennaria*). Han lader imidlertid uafgjort, hvorvidt *Clavidae* har sin Oprindelse i *Coryne*-former, eller om begge disse Familier, der hver for sig danner Udgangspunkt for en Række andre, har sit Udspring i endnu ukjendte Former. Jeg er enig med *Schneider* i, at begge disse Opfatninger har lige megen eller lige liden Støtte i de hidtil kjendte Fakta, og jeg følger ham derfor ved foreløbig at indordne Hydroidefamilierne efter to forskellige Linier med Udgangspunkter respektive i Fam. *Corynidae* og *Clavidae*.

Inden Fam. *Corynidae* findes en Udvikling i to Retninger, mod *Myriotheilidae* (kun repræsenteret ved en enkelt Form *C. gigantea*), og mod *Tubularidae*. Paa Overgangen til denne Familie har tidligere staaet Fam. *Pennaridae* karakteriseret derved, at Hydrantherne havde baade traadformede og kolleformede Tentakler. *Schneider* har opløst denne Familie, eller rettere sagt, han har stillet en Del af dens Slægter over i Fam. *Corynidae*, og paa den anden Side har han indlemmet i den alle *Tubularidae*. Jeg er enig i, at Fam. *Pennaridae* ikke kunde blive staaende i sin oprindelige Skikkelse, men idet nogle af dens Arter henføres til *Corynidae*, og de øvrige til *Tubularidae*, opløses den jo af sig selv, og jeg finder ingen Grund til at forandre Navn for Fam. *Tubularidae*, fordi om man henfører til den endel Arter, der tidligere har tilhørt *Pennaridae*.

I Principet for Delingen af denne Familie er jeg heller ikke ganske enig med *Schneider*. Han henfører til

he has attributed to it any great importance. Strange to say, the development of the blastostyles it otherwise not taken into consideration in the systematisation; and therefore I cannot omit to point to it as to a guide which, in my opinion, must lead to the construction of a natural system.

I take the derivation of the various families in this system to be as shown in fig. 1.

*Schneider* has drawn attention to the fact of its being unnatural to set up, as has always hitherto been done, *Clavidae* as the starting-point for all the athecate hydroids. *Corynidae*, which have clavate tentacles, can scarcely be derived from species with filiform tentacles, as the development of the tentacles elsewhere in the system goes in the opposite direction (transition from *Coryne* to *Pennaria*). *Schneider*, however, leaves undetermined the question whether *Clavidae* have arisen from *Coryne* forms, or whether both families, which each form the starting-point for a number of others, originate in hitherto unknown forms. I agree with *Schneider* in considering that one of these theories has as much or as little support as the other in the hitherto known facts, and I therefore follow him in a temporary arrangement of the hydroid families in two different lines, starting with the families *Corynidae* and *Clavidae*.

In the family *Corynidae*, there is a development in two directions, towards *Myriotheilidae* (only represented by a single form, *C. gigantea*), and towards *Tubularidae*. The family *Pennaridae* has hitherto been the transitional link between the two families, and has been characterised by the circumstance that the hydranths had both filiform and clavate tentacles. *Schneider* has broken up this family, or rather he has placed some of its genera in the family *Corynidae*, and on the other hand has incorporated in it all the *Tubularidae*. I am also of opinion that the family *Pennaridae* could not remain in its original form; but in referring some of its species to *Corynidae*, and the remainder to *Tubularidae*, it dissolves itself; and I see no reason for changing the name of the family *Tubularidae*, because a few species are referred to it which have formerly belonged to *Pennaridae*.

Nor do I quite agree with *Schneider's* principle in the division of this family. To *Corynidae* he refers *Stau-*



*Corynidae*: *Stauridium*, *Halocharis*, *Cladonema*, *Cladocoryne*, — og til *Tubularidae* (*Pennaridae*), *Pennaria*, *Acaulis*, *Heterostephanus* o. s. v., idet han lader de traadformede Tentaklers Udvikling bestemme Grænsen mellem Familierne. Jeg finder imidlertid ikke Spranget større mellem Arter med korte traadformige Tentakler (*Stauridium*) og saadanne med lange (*Pennaria*), end det er mellem en almindelig *Coryne* med kun kolleformede Tentakler og f. Eks. en *Stauridium*; begge Forandringer i Tentaklernes Bygning er Skridt i en Udvikling fra *Coryne* mod *Tubularia*, og *Schneiders* Grænse mellem disse to Familier forekommer mig derfor meget vilkaarlig. Jeg finder det naturligere at henregne til *Corynidae* alle de Arter, der bærer Tentaklerne spredt eller siddende i Kredse jævnt fordelt over Hydranthen, medens alle *Tubularidae* har sine Tentakler anordnet i to skarpt adskilte Kredse paa henholdsvis den proximale og den distale Del af Hydranthen. Ved at betragte de to Grupper, hvor Fam. *Pennaridae* efter dette maa deles, ser man at der ogsaa i andre Retninger er Overensstemmelse mellem Arterne inden hver af disse Grupper. Til *Corynidae* maa henregnes, foruden de af *Schneider* nævnte Arter, ogsaa *Pennaria* og *Acaulis*, og alle disse har lange, kegleformig tilspidsede Hydranther og Gonophorerne siddende paa Hydranthen, medens *Heterostephanus* (*Vorticifera* og *Acharadria*), der maa henregnes til *Tubularidae*, stemmer fuldstændig overens med disse i Hydranthernes Bygning, idet den proximale Del er sterkt udvidet saa at dens diameter omtrent er lig Hydranthers Længde, — og *Heterostephanus* slutter sig til denne Familie ogsaa derved, at dens Gonoforer bæres paa Blastostyler, der sidder i en Kreds indenfor de proximale Tentakler.

Angaaende *Myriothele's* Stilling som en selvstændig Familie, har jeg nedenfor anført mine Grunde for denne Opfatning.

Den anden Gren af de athecate Hydroider med Udgangspunkt i *Clavidae*, danner en temmelig tæt sluttet Række af Slægter, som tidligere har været stillet i mange forskellige Familier. *Levinson* har (79) reduceret disses Tal betydelig, idet han under Fam. *Bougainvillidae* sammensluttede alle Arter med traadformede Tentakler stillet i en Kreds, og *Schneider* er gaaet endnu videre, nemlig ved at henføre alle disse til Fam. *Clavidae*, idet han dog giver *Eudendridae* Plads som en Familie for sig.

Naar han saaledes under Fam. *Clavidae* sammenfatter Arter med spredte Tentakler og saadanne, der har Tentaklerne stillet i en Kreds, — da forekommer det mig, at han gaar for vidt med Hensyn til Forenkling af Systemet. — Selv om Tentaklerne hos enkelte Arter af *Bougainvillidae* ikke kan siges at staa kun i en Kreds, (som hos *Perigonimus*), saa er de dog her overalt samlede paa et forholdsvis lidet Parti af Hydranthen; og Forholdet er her et ganske andet end hos de forskellige *Clava*-Arter, hvis Tentakler sidder jævnt fordelt over hele Hydranthen; og man vil neppe nogensinde være i Tvivl om, til hvilken af de to Grupper en Hydranth skal henregnes. De øvrige Familier blandt de athecate Hydroider, karakteriseres ogsaa ved Tentaklernes Forhold, og de Klofter, der adskiller dem,

*ridium*, *Halocharis*, *Cladonema*, and *Cladocoryme*; and to *Tubularidae* (*Pennaridae*), *Pennaria*, *Acaulis*, *Heterostephanus*, etc., letting the development of the filiform tentacles determine the boundary between the families. I do not however, consider the break between species with short filiform tentacles (*Stauridium*), and those with long (*Pennaria*), greater than that between an ordinary *Coryne* with only clavate tentacles, and a *Stauridium*, for instance; both the changes in the structure of the tentacles are stages in a development from *Coryne* to *Tubularia*, and therefore *Schneider's* boundary between these two families seems to me to be a very arbitrary one. I consider it more natural to refer to *Corynidae* all those species whose tentacles are scattered or arranged in rings evenly distributed over the hydranth, while all *Tubularidae* have their tentacles arranged in two distinctly separated rings, one on the proximal, and the other on the distal portion of the hydranth. On looking at the two groups into which, according to this, the family *Pennaridae* must be divided, it will be seen that in other particulars too, there is a similarity between the species in each of these groups. In addition to the species named by *Schneider*, *Pennaria* and *Acaulis* must be referred to *Corynidae*, and all these have long, conically-pointed hydranths, and the gonophores attached to the hydranth; while *Heterostephanus* (*Vorticifera* and *Acharadria*), which must be referred to the *Tubularidae*, agrees perfectly with them in the structure of the hydranths, their proximal part being greatly expanded, so that its diameter is about equal to the length of the hydranth, and this species also goes with the *Tubularidae*, from the fact of its gonophores being upon blastostyles which are arranged in a circle within that of the proximal tentacles.

My reasons for regarding *Myriothele* as an independent family are stated below.

The other branch of athecate hydroids, with *Clavidae* as its starting-point, forms a fairly compact series of genera, which have formerly been placed in many different families. *Levinson* (79) has reduced the number of these considerably, uniting under the family *Bougainvillidae* all species with filiform tentacles arranged in a ring; and *Schneider* has gone even further, and referred them all to the family *Clavidae*, although he gives *Eudendridae* a place by itself, as a separate family.

When *Schneider* thus comprises in the family *Clavidae*, species with scattered tentacles, and species with the tentacles arranged in a ring, it seems to me that he goes too far with regard to the simplification of the system. Even if the tentacles in certain species of *Bougainvillidae* cannot be said to stand only in a ring (as in *Perigonimus*), yet they are always congregated on a comparatively small portion of the hydranth, and the conditions here are quite different to those in the various *Clava* species, where the tentacles are evenly distributed over the whole hydranth; and there will hardly ever be a doubt as to which of the two groups a hydranth is to be referred to. The remaining families among the athecate hydroids are also characterised by the position of the tentacles; and the gaps which sepa-

forekommer mig ikke at være dybere end den, man finder mellem *Clavidae* og *Bougainvillidae*.

Angaaende *Eudendridae*'s Særstilling som en selvstændig Familie kan jeg kun give *Schneiders* Udtalelser min Tilslutning. Man ser her en Udvikling af Hydrantherne i samme Retning, som den findes hos *Tubularidae*, og som viser sig ved en sterk Udvikling af Hydranthens proximale Del i Forhold til den distale.

At *Haleciidae* maa betragtes som Udgangspunkt for de forskjellige Familier blandt de thecaphore Hydroider, og at denne Familie atter stammer fra *Bougainvillidae*, — dette findes saa vel begrundet i *Schneiders* Afhandling, at det er unødvendigt at udtale sig nærmere derom.

Indenfor *Haleciidae* danner Slægten *Ophiodes* Overgang til *Plumularidae*, medens paa den anden Side ogsaa *Campanularidae* maa søge sin Oprindelse i denne Familie.

Da *Lerinsen* og *Schneider* i de ovenfor omtalte Afhandlinger har samlet og gennemgaaet den senere Tids Literatur over Hydroiderne, anser jeg det for overflødigt at gjentage det samme her; jeg skal derfor blot i Korthed omtale nogle Arbejder, der specielt behandler Norges Hydroidefauna.

Det er væsentlig Professorerne *M.* og *G. O. Sars*, der har bidraget til Kundskaben om vort Lands Hydroider; men de har ogsaa undersøgt saagodtsom hele vor Kyststrækning, og deres Bidrag giver saaledes et samlet Billede af vor Fauna, paa samme Tid som de indeholder Beskrivelser af en Mængde nye Former, der tildels har været Representanter for eiendommelige nye Slægter.

Professor *M. Sars* har i sine mange Afhandlinger over dette Thema (98—105) givet detaillerede Beskrivelser over en stor Del af vore athecate Hydroider og ogsaa nogle thecate, og som Regel er disse Beskrivelser saa indgaaende og præcise, at der intet er at tilføie til dem. Hans mange og interessante Bidrag til Læren om Hydroidernes Forplantning er saa vel kjendte at jeg ikke omtaler dem her; kun vil jeg nævne, at allerede han (103) idet han udtaler sig om Principerne for Hydroidernes Systematik, protesterer mod at man adskiller Arter, der frembringer fri Meduser, fra saadanne, hvis Gonoforer forbliver sessile.

*G. O. Sars* har i sin: „Bidrag til Kundskaben om Norges Hydroider,“ foruden Beskrivelser af nye Arter, ogsaa givet en samlet Fremstilling af alle Norges Hydroider, med Hensyn paa deres Udbredelse langs vor Kyst, og i de forskjellige Dybderegioner. Han aabenbarer herunder en tidligere fuldstændig ukjendt Hydroiderfauna fra Havets større Dybder, idet han paa en Reise med Oplodningsskibet „Hansteen“ havde fundet en stor Mængde Hydroider paa Dybder mellem 50—300 Favne, medens man tidligere væsentlig har fundet Hydroiderne ovenfor 50 Favnes Dyb.

rate them do not seem to me to be wider than those found between *Clavidae* and *Bougainvillidae*.

With regard to *Eudendridae*'s peculiar position as an independent family, I can only subscribe to *Schneider's* expressed opinions. The development of the hydranths here is similar to that in *Tubularidae*, being greater in the proximal part of the hydranth as compared with the distal part.

The arguments for regarding *Haleciidae* as the starting-point for the various families of the thecaphore hydroids, and as being descended in its turn from *Bougainvillidae*, are so well-founded in *Schneider's* treatise, that it is not necessary to say more on the subject.

In *Haleciidae*, the genus *Ophiodes* forms the transition to *Plumularidae*, while on the other hand, *Campanularidae* must also seek its origin in this family.

As *Lerinsen* and *Schneider*, in the above-mentioned treatises, have brought together and reviewed the hydroid literature of recent times, I consider it would be superfluous to repeat the same thing here; I shall therefore only briefly mention some works which especially treat of the hydroid fauna of Norway.

Professors *M.* and *G. O. Sars* have been the principal contributors to the knowledge of the Hydroida of Norway. They have explored almost the entire length of the Norwegian coast, and thus their contributions give a complete representation of its fauna, while at the same time they contain descriptions of a number of new forms, which have, to some extent, been representatives of peculiar new genera.

In his numerous treatises upon this subject, Prof. *M. Sars* (98—105) has given detailed descriptions of a large proportion of our athecate hydroids, and also of some thecate hydroids. As a rule, these descriptions are so minute and exact, that there is nothing to add to them. His numerous and interesting contributions to the theory of the propagation of hydroids is so well known that I do not mention it here; I will only say that in speaking (103) on the subject of the principles for the systematic of hydroids, he already protests against the separation of species that produce free-swimming medusæ, and those whose gonophores remain sessile.

Prof. *G. O. Sars*, in his „Bidrag til kundskaben om Norges hydroider“ (Contribution to the Knowledge of the Hydroids of Norway), in addition to descriptions of new species, has also given a complete account of all the hydroids of Norway, with reference to their distribution along the Norwegian coast, and in the various depths. In doing this, he reveals a previously utterly unknown hydroid-fauna from the deeper parts of the ocean, having found, when on a voyage in the surveying-steamer „Hansteen“, a large number of hydroids in depths of from 50 to 300 fathoms, whereas previously hydroids had principally been found in depths of less than 50 fathoms.



Han opregner, som hørende til Norges Fauna, 84 Arter, henførte til 36 Slægter. Af disse hører 13 Slægter med tilsammen 27 Arter til de athecate Hydroider; 41 af de af G. O. Sars opnævnte Arter var fundet nedenfor 100 Favne.

Siden 1873, da den netop omtalte Afhandling blev offentliggjort, er Kjendskabet til vor Hydroidefauna betydelig forøget, idet Indsamlinger er foretaget paa forskellige Steder langs Kysten, men om de Fund, som herunder er gjort, er meget lidet offentliggjort. V. Storm har i 1880, i „Bidrag til Trondhjemsfjordens Fauna“, givet en Oversigt over denne Fjords rige Hydroidefauna; men ellers har man ingen Redegjørelse for de sidste 25 Aars Arbejde paa dette Felt.

Ved at sammenholde de Schemaer, der i denne Afhandling omfatter de norske Arter sammenstillet med Nordhavsexpeditionens, vil man se, at Tallet af norske Hydroider er betydelig forøget efter G. O. Sars's Meddelelser, idet Antallet af dem nu beløber sig til 125, (i Modsætning til hans 84), af hvilke 15 ikke tidligere er beskrevne.

#### Hydroidernes Udbredelse i Dybden.

Naar jeg nedenfor giver en Fortegnelse over Nordhavsexpeditionens og Norges Hydroider ordnet efter deres Udbredelse i Dybden, saa bliver jeg nødt til ogsaa at gentage, hvad G. O. Sars har udtalt herom i sin tabellariske Oversigt over Norges Hydroider; men Udgangspunktet for grupperingen er her et andet, idet jeg finder det af Interesse at undersøge disse fastsiddende Dyrs Udbredelse i Forhold til Havvandets Temperatur og Saltgehalt, forsaavidt man — efter de sidste Aartiers hydrografisk-biologiske Undersøgelser — kjender disse Forholdes Omvekslinger i Havets forskellige Dybder. Dr. Hjort udtaler<sup>1</sup> under en kort Fremstilling af Maalet for og Resultaterne af de hidtil udførte Arbejder paa Havforskningens Omraade, at man for det Norske Nordhav kan opstille tre forskellige Dybde-regioner, nemlig:

- 1) De periodiske Vekslingers Region, ovenfor 250 m.
- 2) De konstante Atlanterhavsforholds Region 250—500 m.
- 3) Ishavsvandets Region, nedenfor 500 m.

I den første af disse Regioner veksler Vandets Temperatur og Saltgehalt med Aarstiderne, idet der om Sommeren findes meget ferskt Vand i Overfladen, og Forskjellen i Saltgehalt fra Overflade til 250 m.s Dyb kan saaledes i denne Aarstid være temmelig stor, medens om Høsten Lagene begynder at blive mere ensartede, og ved Vintertid er Havet i denne Region homogent med Hensyn

He reckons, as belonging to the fauna of Norway, 84 species, referred to 36 genera. 13 of these genera, comprising 27 species, belong to the athecate hydroids. 41 of the species named by him were found at a depth of more than 100 fathoms.

Since 1873, when the above-mentioned treatise was published, our acquaintance with Norwegian hydroid fauna has been considerably enlarged, collections having been made at various places along the coast; but very little has been published on the subject of the discoveries thus made. In 1880, V. Storm, in his „Bidrag til Trondhjemsfjordens fauna“ (Contribution to the Fauna of the Trondhjem Fjord), has given a general survey of the abundant hydroid-fauna of that fjord; but with this exception, there is no account of the work of the last 25 years in this field.

On comparing the tables in this paper, which give the Norwegian species placed side by side with those of the N. Atlan. Exp., it will be seen that the number of Norwegian hydroids has considerably increased since the date of G. O. Sars's communications, the number now amounting to 125 (as against his 84), 15 of which have not previously been described.

#### The bathymetric distribution of hydroids.

In giving below a list of the N. Atlan. Exp. and Norwegian hydroids, arranged according to their distribution in depths, I shall be obliged to repeat what G. O. Sars has said on the subject in his tabular survey of Norwegian hydroids; but here the starting-point for the grouping is different, as I consider it interesting to investigate the distribution of these fixed animals in relation to the temperature and saltness of the water, as far as the variations in these conditions in various depths of the sea are known from the hydrographic biological investigations of the last few decades Dr. J. Hjort,<sup>1</sup> in a short account of the aim and results of the work up to the present accomplished in the field of marine investigation, observes that three different depths can be given for the Norwegian North Atlantic, viz.

- 1) Region of periodical variations, down to 250 m.
- 2) Region of the constant conditions of the Atlantic, 250—500 m.
- 3) Region of the Arctic Sea water, below 500 m.

In the first of these regions, the temperature and saltness of the water vary with the time of year, as there is much fresh water on the surface in summer, and the difference in saltness between the surface and a depth of 250 m. can thus be very great; while in autumn, the strata begin to be more alike, and in winter the sea in this region is homogeneous as regards its saltness. Similarly the tem-

<sup>1</sup> Undersøgelser over Organismerne og Strømforholdene i det norske Nordhav. „Naturen“ 1897.

<sup>1</sup> „Undersøgelser over organismerne og strømforholdene i det norske Nordhav“. (Investigation of the Organisms and Currents in the Norwegian North Atlantic). „Naturen“, 1897.



paa Saltgehalt. Ligeledes forandres Temperaturen i dette Lag overensstemmende med Vekslingen i Luftens Temperatur i Aarets løb, dog saaledes at Maximum og Minimum indtræder nogle Maaneder senere i Dybet end paa Overfladen.

Nedenfor 250 m. naar imidlertid ikke disse aarlige Vekslinger i Temperatur og Saltgehalt, og man har her „de konstante Atlanterhavsforholds Region“ med forholdsvis høi Saltgehalt (35 ‰) og Temperatur (6°—7°).

I de største Dyb derimod, nedenfor 500 m. synker Temperaturen, indtil under Nulpunktet, ogsaa Saltgehalten er her lavere paa Grund af Opblanding med Polarhavets Isvand.

Nedenstaaende Tabel fremstiller Hydroidernes Udbredelse i Dybden, ordnet efter de nævnte Regioner — kun har jeg som en fjerde Region opstillet den rent littorale Zone.

perature in this stratum varies with the variation of the temperature of the atmosphere in the course of the year, though in such a manner that the maximum and minimum are reached some months later in the depths than on the surface.

These annual variations in temperature and saltness do not, however, extend below 250 m., and here we come to the region of the constant conditions of the Atlantic, with a comparatively high degree of saltness (35 ‰) and temperature (6°—7°).

In the greatest depth, on the other hand — below 500 m., — the temperature falls below freezing-point, and the degree of saltness is also lower on account of its admixture with the ice-water of the polar sea.

The following table shows the distribution of Hydroids in the sea-depths, arranged according to the above regions, to which I have added a fourth region — the purely littoral zone.

Hydroidernes navne. (Names of Hydroids).	Littoral Zone. (Littoral Zone).	Ovenfor 250 m. (Less than 250 m.).	250 m.—500 m. (Between 250 & 500 m.).	Nedenfor 500 m. (More than 500 m.).
<i>Coryne pusilla</i> . . . . .	†			
„ <i>eximia</i> . . . . .		†		
„ <i>sarsii</i> . . . . .	†			
„ <i>brevicornis</i> . . . . .				
„ <i>hincksii</i> . . . . .				
„ <i>lovenii</i> . . . . .	†			
„ <i>longicornis</i> . . . . .				
„ <i>gigantea</i> . . . . .				
<i>Pennaria primarius</i> . . . . .		†		
<i>Heterostephanus annulicornis</i>		†		
<i>Gymnogonos crassicornis</i> . .			†	
<i>Corymorpha nutans</i> . . . . .		†		
„ <i>sarsii</i> . . . . .		†		
„ <i>glacialis</i> . . . . .		†	†	
„ <i>nana</i> . . . . .		†		
<i>Lampra sarsii</i> . . . . .				†
„ <i>atlantica</i> . . . . .				†
„ <i>purpurea</i> . . . . .			†	†
<i>Tubularia variabilis</i> . . . .		†	†	†
„ <i>indivisa</i> . . . . .		†		
„ <i>regalis</i> . . . . .			†	†
„ <i>asymmetrica</i> . . . . .			†	
„ <i>obliqua</i> . . . . .				
„ <i>larynx</i> . . . . .		†	†	†
„ <i>humilis</i> . . . . .		†		
„ <i>prolifer</i> . . . . .		†	†	
„ <i>cornucopia</i> . . . . .				†
Hydroidernes navne. (Names of Hydroids).	Littoral Zone. (Littoral Zone).	Ovenfor 250 m. (Less than 250 m.).	250 m.—500 m. (Between 250 m. & 500 m.).	Nedenfor 500 m. (More than 500 m.).
<i>Myriothele cocksii</i> . . . . .		†		
„ <i>phrygia</i> . . . . .				†
„ <i>verrucosa</i> . . . . .				
„ <i>gigantea</i> . . . . .				†
„ <i>minuta</i> . . . . .				
„ <i>mitra</i> . . . . .				†
<i>Clava squamata</i> . . . . .	†			
„ <i>multicornis</i> . . . . .		†		
„ <i>parasiticum</i> . . . . .		†		
<i>Perigonimus abyssii</i> . . . .		†	†	†
„ <i>repens</i> . . . . .				
„ <i>muscoides</i> . . . . .		†		
„ <i>sarsii</i> . . . . .				
„ <i>rosens</i> . . . . .		†		
<i>Bougainvillia v. benedeni</i> . .	†			
„ <i>ramosa</i> . . . . .	†			
„ <i>obscura</i> . . . . .				
<i>Dicoryne flexuosa</i> . . . . .		†		
„ <i>conferta</i> . . . . .		†	†	
<i>Hydractinia humilis</i> . . . .		†		
„ <i>sarsii</i> . . . . .		†		
„ <i>carnea</i> . . . . .		†	†	
„ <i>allmanii</i> . . . . .				†
„ <i>ornata</i> . . . . .		†		
„ <i>echinata</i> . . . . .		†		
„ <i>minuta</i> . . . . .		†		
<i>Eudendrium ramosum</i> . . . .		†		

Hydroidernes Navne. (Names of Hydroids).	Littoral Zone. (Littoral Zone).	Ovenfor 250 m. (Less than 250 m.).	250 m.—500 m. (Between 250 & 500 m.).	Overfor 500 m. (More than 500 m.).
<i>Eudendrium rameum</i> . . . . .		†		
.. <i>arbuscula</i> . . . . .				
.. <i>annulatum</i> . . . . .	†			
.. <i>insigne</i> . . . . .	†			
.. <i>vaginatum</i> . . . . .	†			
.. <i>dispar</i> . . . . .				
.. <i>tenellum</i> . . . . .		†		
.. <i>capillare</i> . . . . .		†		
.. <i>planum</i> . . . . .				
.. <i>hyalinum</i> . . . . .		†		
<i>Monobrachium parasiticum</i> . . . . .				
<i>Halecium planum</i> . . . . .		†		
.. <i>plumosum</i> . . . . .				
.. <i>halecinum</i> . . . . .		†		
.. <i>labrosum</i> . . . . .		†		
.. <i>irregulare</i> . . . . .				
.. <i>tortile</i> . . . . .		†		
.. <i>muricatum</i> . . . . .		†	†	†
.. <i>scutum</i> . . . . .		†		
.. <i>beanii</i> . . . . .		†	†	
.. <i>sessile</i> . . . . .		†		
.. <i>schneiderii</i> . . . . .				
<i>Ophiodes gorgonoides</i> . . . . .		†		
.. <i>parasitica</i> . . . . .		†		
<i>Lafoëa pygmaea</i> . . . . .				
.. <i>serpens</i> . . . . .		†	†	†
.. <i>abietina</i> . . . . .		†	†	†
.. <i>gracillima</i> . . . . .		†	†	†
.. <i>dumosa</i> . . . . .		†		
.. <i>fruticosa</i> . . . . .		†	†	
.. <i>symmetrica</i> . . . . .			†	
.. <i>gigantea</i> . . . . .		†		†
.. <i>pinnata</i> . . . . .		†	†	†
<i>Campanularia verticillata</i> . . . . .		†	†	†
.. <i>gelatinosa</i> . . . . .		†		
.. <i>geniculata</i> . . . . .		†		
.. <i>dichotoma</i> . . . . .		†		
.. <i>longissima</i> . . . . .		†		
.. <i>flexuosa</i> . . . . .	†	†		
.. <i>lorenii</i> . . . . .		†		
.. <i>hyalina</i> . . . . .		†		
.. <i>gracilis</i> . . . . .		†		
.. <i>johnstonii</i> . . . . .		†		
.. <i>hincksii</i> . . . . .		†		
.. <i>calyculata</i> . . . . .		†		
.. <i>rotabilis</i> . . . . .		†		
<i>Campanulina plicatilis</i> . . . . .		†	†	
.. <i>panicula</i> . . . . .		†		
Hydroidernes Navne. (Names of Hydroids).	Littoral Zone. (Littoral Zone).	Ovenfor 250 m. (Less than 250 m.).	250 m.—500 m. (Between 250 & 500 m.).	Overfor 500 m. (More than 500 m.).
<i>Campanulina producta</i> . . . . .		†	†	
.. <i>pedicellaris</i> . . . . .				
.. <i>fastigata</i> . . . . .		†		
.. <i>syringa</i> . . . . .		†		
<i>Lafoëina tenuis</i> . . . . .		†	†	
<i>Sertularella gayi</i> . . . . .		†		
.. <i>polyzonias</i> . . . . .	†	†		
.. <i>rugosa</i> . . . . .	†	†		
.. <i>tenella</i> . . . . .		†		
.. <i>tricuspidata</i> . . . . .		†	†	†
<i>Dynamena pumila</i> . . . . .	†			
.. <i>operculata</i> . . . . .	†			
.. <i>unilateralis</i> . . . . .		†		
.. <i>fallax</i> . . . . .		†	†	†
.. <i>resaca</i> . . . . .	†	†		
.. <i>tamarisca</i> . . . . .				†
<i>Thuiaria alata</i> . . . . .		†		
.. <i>pinaster</i> . . . . .		†		
.. <i>elegans</i> . . . . .			†	
.. <i>tenera</i> . . . . .		†		
.. <i>argentea</i> . . . . .		†		
.. <i>abietina</i> . . . . .		†		
.. <i>filicula</i> . . . . .		†		
.. <i>articulata</i> . . . . .		†		
.. <i>thuia</i> . . . . .		†		
<i>Selaginopsis fusca</i> . . . . .		†		
.. <i>mirabilis</i> . . . . .				
.. <i>obsoleta</i> . . . . .		†		
.. <i>arctica</i> . . . . .		†		
<i>Hydrallmannia falcata</i> . . . . .		†	†	†
<i>Aglaophenia integra</i> . . . . .		†		
.. <i>pourtalesii</i> . . . . .		†		
.. <i>bicuspis</i> . . . . .		†		
.. <i>compressa</i> . . . . .			†	
.. <i>formosa</i> . . . . .	†			
.. <i>myriophyllum</i> . . . . .			†	†
<i>Plumularia pinnata</i> . . . . .		†		
.. <i>elegantula</i> . . . . .		†	†	
.. <i>rubra</i> . . . . .			†	
.. <i>fragilis</i> . . . . .		†		
.. <i>setacea</i> . . . . .		†		
.. <i>gracillima</i> . . . . .		†	†	†
.. <i>variabilis</i> . . . . .			†	
.. <i>frutescens</i> . . . . .		†		
.. <i>catharina</i> . . . . .		†		
.. <i>flabellata</i> . . . . .		†		
<i>Antennularia norregica</i> . . . . .			†	†
.. <i>antennina</i> . . . . .		†	†	

Ved Betragtning af ovenstaaende Tabel ser man, at ca.  $\frac{5}{6}$  af de Hydroider, for hvilke Dybdeangivelser findes, har sit Tilholdssted i Regionen ovenfor 250 m., og er saaledes udsat for Aarstidernes skiftende Forhold med Hensyn til Vandets Temperatur og Saltgehalt. De Arter, der vokser paa større Dyb, horer hovedsagelig til *Tubularidae*, *Myriothelidae* og slægten *Lafoëa*, og de fleste af dem forekommer ogsaa i den øverste Region, og synes altsaa at være særdeles uafhængige af disse Forhold; specielt er dette Tilfældet indenfor Slægterne *Tubularia* og *Lafoëa*, hvor næsten alle Arter forekommer i alle tre Regioner.

On looking at the above table, it will be seen that about  $\frac{5}{6}$  of the hydroids for which a statement of depth is given, inhabit the region down to 250 m., and are therefore exposed to the varying conditions of the seasons as regards the temperature and saltness of the water. The species that grow in greater depths belong principally to *Tubularidae*, *Myriothelidae* and the genus *Lafoëa*, and most of them also occur in the uppermost region, and thus seem to be peculiarly independent of these conditions. This is especially the case with the genera *Tubularia* and *Lafoëa*, where nearly all the species occur in all these regions.

Fortegnelse over de af Nordlandsexpeditionens Stationer, hvor Hydroider blev fundet.  
(List of the North Atlantic Expedition Stations where Hydroids were Found).

Station No. (Station No.).	° N. B. (N. Lat.).	° O. (V.) L. (E. (W.) Long)	Dybde i m. (Depth m.).	Temp. ° C. (Tempera ° C).	De paa Stationen fundne Arter. (Species found).
9	61.30	3.37	377	+ 5.9	<i>Plumularia rubra</i> .
10	61.41	3.19	402	+ 6	<i>Perigenimus repens</i> , <i>Halecium beanii</i> , <i>Plumularia rubra</i> , <i>Aglao-phenia myriophyllum</i> , <i>Antennularia norvegica</i> .
18	62.44	1.48	753	÷ 1.6	<i>Lafoëa gracillima</i> , <i>Campanulina plicatilis</i> , <i>Aglao-phenia myriophyl-lum</i> , <i>Antennularia norvegica</i> .
40	63.22	5.29	2222	÷ 1.2	<i>Lampra atlantica</i> , <i>Myriothela mitra</i> .
48	64.36	10.22	547	÷ 0.3	<i>Lafoëa gracillima</i> .
52	65.47	3.7 W.	3403	÷ 1.17	<i>Tubularia larynx</i> .
79	64.48	6.36	283	+ 6.9	<i>Antennularia norvegica</i> .
137	67.24	8.58	827	÷ 1	<i>Lampra purpurea</i> , <i>Hydractinia allmanii</i> .
150	67.11	13.21	ca. 400	?	<i>Tubularia prolifer</i> .
164	68.21	10.40	836	÷ 0.7	<i>Lafoëa gigantea</i> .
175	69.17	14.35	175	+ 3.01	<i>Sertularella tricuspidata</i> .
192	69.44	16.15	1187	÷ 0.66	<i>Lafoëa abietina</i> , <i>Dynamena tamarisca</i> .
200	71.45	15.41	1134	÷ 0.97	<i>Lafoëa abietina</i> , <i>Lafoëa pinnata</i> , <i>Dynamena tamarisca</i> .
235	70.59	8.55	179	0	<i>Hydrallmania falcata</i> .
248	67.56	4.11	1423	÷ 1.28	<i>Lampra sarsii</i> .
261	70.47	28.30	232	2.8	<i>Corymorpha nana</i> .
262	70.36	32.35	271	+ 1.9	<i>Thuiaria filicula</i> , <i>Thuiaria articulata</i> .
267	71.42	37.1	271	÷ 1.43	<i>Tubularia larynx</i> , <i>Lafoëa fruticosa</i> , <i>Plumularia fragilis</i> .
270	72.27	35.1	249	0	<i>Hydractinia ornata</i> , <i>Lafoëa pinnata</i> .
290	72.27	20.51	349	+ 3.5	<i>Tubularia regalis</i> , <i>Plumularia variabilis</i> .
303	75.12	3.2	2195	÷ 1.57	<i>Myriothela phrygia</i> , <i>Myriothela gigantea</i> .
312	74.54	14.5	1203	÷ 1.23	<i>Hydractinia allmanii</i> , <i>Campanulina plicatilis</i> .
313	74.55	15.49	373	+ 2.44	<i>Lafoëa symmetrica</i> , <i>Aglao-phenia compressa</i> .
315	74.53	15.55	329	2.5	<i>Eudendrium rameum</i> , <i>Dynamena fallax</i> .



Stations No. (Station No.).	°N. B. (N. Lat.).	°O. (V.) L. (E. (W.) Long)	Dybde i m. (Depth m.).	Temp, °C. (Tempera °C.).	De paa Stationen fundne Arter. (Species found).
322	74.57	19.52	38	+ 0.24	<i>Halecium muricatum</i> , <i>Lafoëa fruticosa</i> , <i>Lafoëa abietina</i> , <i>Campanularia volubilis</i> , <i>Sertularella polyzonias</i> , <i>Sertularella tricuspidata</i> , <i>Dynamena unilateralis</i> , <i>Selaginopsis obsoleta</i> , <i>Selaginopsis arctica</i> .
325	74.2	20.30	165	+ 0.9	<i>Tubularia variabilis</i> , <i>Perigonimus abyssi</i> .
341	76.32	13.53	216	+ 0.75	<i>Sertularella tricuspidata</i> .
343	76.34	12.51	1359	÷ 1.19	<i>Tubularia variabilis</i> , <i>Tubularia regalis</i> , <i>Halecium muricatum</i> .
353	77.58	5.10	2438	÷ 1.4	<i>Tubularia cornucopia</i> , <i>Sertularella tricuspidata</i> .
357	78.3	11.18	229	+ 1.9	<i>Campanulina plicatilis</i> , <i>Aglaophenia formosa</i> .
362	79.59	5.40	839	÷ 1	<i>Tubularia variabilis</i> .
363	80.3	8.28	475	+ 1.14	<i>Lafoëa fruticosa</i> .
374	78.16	15.33	110	+ 0.7	<i>Hydractinia minuta</i> , <i>Monobrachium parasiticum</i> .

## Athecata.

### Fam. Corynidae.

*Hydranth spindel- eller ægformig med spredt stillede  
Tentakler, hvoraf altid nogle kølgeformede.*

Denne Familie findes ikke repræsenteret i Nordhavs-expeditionens Materiale; men jeg hidsætter dog, for Fuldstændigheds Skyld en Tabel over Familiens norske Arter. De fleste tilhører slægten *Coryne*, og blandt disse er der en, *C. gigantea*, der har en afvigende Form, og som i sin Bygning peger hen mod Fam. *Myriothelidae*. Dens Hydranth er uforholdsmæssig stor, og Perisarcen er hindeagtig tynd, samtidig med at Hydrorhiza har en pladeformig Udbredelse. Alle disse Afvigelser fra det almindelige Forhold hos *Corynidae*, saavel som dens solitære Optræden, tyder paa en Udvikling i Retning mod *Myriothela*, men spranget er endnu for stort til at man kan regne de to Slægter til samme Familie.

Slægten *Pennaria* \*) har i den norske Fauna kun en Representant, nemlig *P. (Acaulis) primarius*.

\*) Om denne Slægts Begrænsning og Stilling i Systemet, se ovenfor Side 6.

## Athecata.

### Fam. Corynidae.

*Hydranth spindle-shaped or oviform, with scattered  
tentacles, always some of them capitate.*

This family is not represented in the collection from the N. Atlan. Exp.; but for the sake of completeness, I append a table of the Norwegian species of the family. Most of them belong to the genus *Coryne*, and among these there is one, *C. gigantea*, which has a different form, and which, in its structure, points to the family *Myriothelidae*. Its hydranth is disproportionately large, and the perisarc is membranous, while the hydrorhiza has a lamelliform expansion. All these differences from the ordinary conditions in *Corynidae*, combined with its solitary occurrence, seem to imply a development in the direction of *Myriothela*, but the gap is still too wide to allow of the two genera being classed in the same family.

The genus *Pennaria* \*) has only one representative in the Norwegian fauna, namely, *P. (Acaulis) primarius*.

\*) Concerning the limits of this genus, and its position in the system, see p. 6.

Fam. Corynidae.

	Hydrocaulus	Gonoforer	Arter	Kolonien		Tentakler	Gonoforer		Findested	
				Bygning	Høide		Past-siddende	Ingen Radialkanaler	Norge	Nordh.-exp. Dybde
Gen. I. <b>Coryne.</b>  Alle Tentakler er kolleformede, siddet spredt over Hydranthen.	Tætte, tydelige Ringe overalt	Spredt over Hydranthenes proximale Del, paa korte Stilke	<b>C. pusilla</b> , Gaertn. 57, 98.	Robust Bygning, Greneenes Vinkel stor	20—40 mm.	Spredt over Hydranthen	Past-siddende	Ingen Radialkanaler	Hele Kyststrekningene	Littoral
	Ringe ved Greneenes Basis og af og til ellers		<b>C. eximia</b> , Althmann. 14.	Slank, svagt forgrenet, Greneenes Vinkel liden	30—50 mm.	Tilnærmelsesvis ordnet i Ringe; i stærke Kredse distalt, i en Kreds distalt.	Fri Meduse	1 Radialkanaler	Besvær, Bodo	100—200 m.
	Næsten ingen Ringe eller Rynker	Proximalt paa lange Stilke	<b>C. sarsii</b> , Lovén. 81.	Fin Bygning, svagt forgrenet	10—20 mm.	Middels lange	Fri Meduse	4 Tentakler	Bergen Lofoten	Littoral
			<b>C. brevicornis</b> , n. sp.	Forgreningerne meget uregelmæssig Greneene stærkt bøjede	Ca. 10 mm.	Bred Basis	Past-siddende	Ingen Radialkanaler	Hammerfest(?)	100—200 m.
			<b>C. hincxsii</b> , Bonnevie. 29.	Svagt og uregelmæssig forgrenet	30—40 mm.	Meget korte	Past-siddende	1 Radialkanaler	Hammerfest	200 m.
	Glat	1—2 ved Basis af Hydranthen	<b>C. lovenii</b> , M. Sars 81, 100.	Sterkt forgrenet, temmelig robust	20—30 mm.	Middels lange	Past-siddende	Fuldstændig Medusebygning; 1 Radialkanaler	Bergen—Lofoten	Littoral
			<b>C. longicornis</b> , Bonnevie. 29.	Sterkt bøjede under Hydranthen	1—2 mm.	Lige lange som Hydranthen	Fri Meduse	1 Radialkanaler	Kristiania Fjord	?
	Perisarc meget tynd, blødt	Spredt over hele Hydranthen	<b>C. gigantea</b> , n. sp.	Tykk, 1 mm i Tverrsnit, blødt og traktet som Sjalstand	10—12 mm.	Stillet i Grupper paa 3—4 ulige Læge; proximalt for Gonoforerne	Past-siddende	Ingen Radialkanaler	Hammerfest	100—200 m.
Gen. II. <b>Pennaria.</b>  To Slags Tentakler; ingen Blastostylar.	Perisarc hindende	Spredt paa Hydranthenes proximale Del	<b>P. primarius</b> , St. 111, 97.	Hydranthenes Længe ca. 1/2 Stilkens; Hætteformede, proximalt paa den	5—7 mm.	Kolleformede Tentakler spredt over Hydranthen. En Kreds store træformede ved Basis	Past-siddende	Ingen Radialkanaler	Lofoten	10—200 mm.



Fam. Corynidae.

	Hydrocaulus	Gonophores	Species	Colony's		Tentacles	Gonophores	Where found	
				Structure	Height mm.			Norway N. Atl. Ex.	Depth m
Gen. I.  Coryne.  All tentacles capitate, scattered over the hydranth.	Close, distinct rings all over	Scattered over the proximal part of the hydranth on short stalks	<b>C. pusilla</b> , Gaerthn. 57, 98.	Robust; angle of ram. large.	20—40	Scattered over the hydranth	Fixed	Entire coast-line	Littoral
				Slender; slightly rami- fied; angle of ram. small.	30—50	Arranged approxi- mately in rings, 4 in one circle distally	Free medusa and 1 tentacles	Espevær, Lofoten	100—200
				Delicate; slightly ramified.	10—20	Medium length	Free medusa	Bergen to Lofoten	Littoral
				Ramifica- tions very irregular; ram. much curved.	6 to 10	Very short Broad base	Fixed	Hammer- fest (1 ?)	100—200
				Slightly and irregularly ramified.	30—40	Nar- row base	Fixed	Hammer- fest	200
	Almost without rings or corrugations.	About 8 in circle round base of hydranth  1 or 2 at base of hydranth	<b>C. brevicornis</b> , n. sp	Much ramified; rather robust.	20—30	Medium length	Fixed	Bergen to Lofoten	— 1 Littoral
				Much curved below the hydranth.	1—2	As long as the hydranth	Free medusa	Kristiania Fjord	—
				Thick, 1 mm. in transverse section; in sigmoid curve.	10—10 when extended	In groups of 3 or 4; unequal lengths; proximal in relation to gonophores	Fixed	Hammer- fest	100—200
				Length of hydranth about equal to that of stem; attas- ching fila- ments on proximal part.	5—7	Capitate, scattered over hydranth; a ring of large, filiform, at base	Fixed	Lofoten	10—200
Gen. II.  Pennaria.  Two kinds of tentacles; no blastostyles.	Unramified	Scattered on proximal part of hydranth	<b>P. primarius</b> , St. 111, 97.						

Fam. Tubularidæ.

*Hydranther* sterkt udvidet i den proximale Del.  
Tentakler stillede i to skarpt adskilte Kredse, en Proximal og en Distal. Gonosome mellem de to Kredse.

Tentakler	Gonoforer	Perisarc	Genera	
Proximale trædformige; Distale kølleformige	Medusoid	Tynd, hindeagtig	<b>Heterostephanus</b> , Allm.	En Kreds tentakelformige Organer paa Stilkens distale Del
Alle Tentakler trædformige	Stylloid	Tynd, hindeagtig	<b>Gymnogonos</b> , Bonnevie	
	Pseudomedusoid	Tynd, hindeagtig	<b>Lampra</b> , Bonnevie	
	Medusoid	Tynd, hindeagtig	<b>Corymorpha</b> , M. Sars	
		Chitinos	<b>Tubularia</b> , Lin.	Ingen saadanne Organer

Denne Familie udmerker sig ved sin Rigdom paa store og prægtige Arter, der ofte er vanskelige at skjelne fra hinanden, hvis man kun har Hydranthers Bygning at domme efter. Men medens de forskellige Arters trophosome viser en ualmindelig Overensstemmelse i sin Bygning, saa er det modsatte Tilfældet med Gonosomerne, og man kan her bedre end i nogen anden Familie paavise alle forskellige Overgangstrin mellem de fastsiddende og kun

Fam. Tubularidæ.

*Hydranths* greatly expanded in their proximal part.  
Tentacles arranged in 2 sharply defined circles, one proximal and one distal. Gonosome between the two circles.

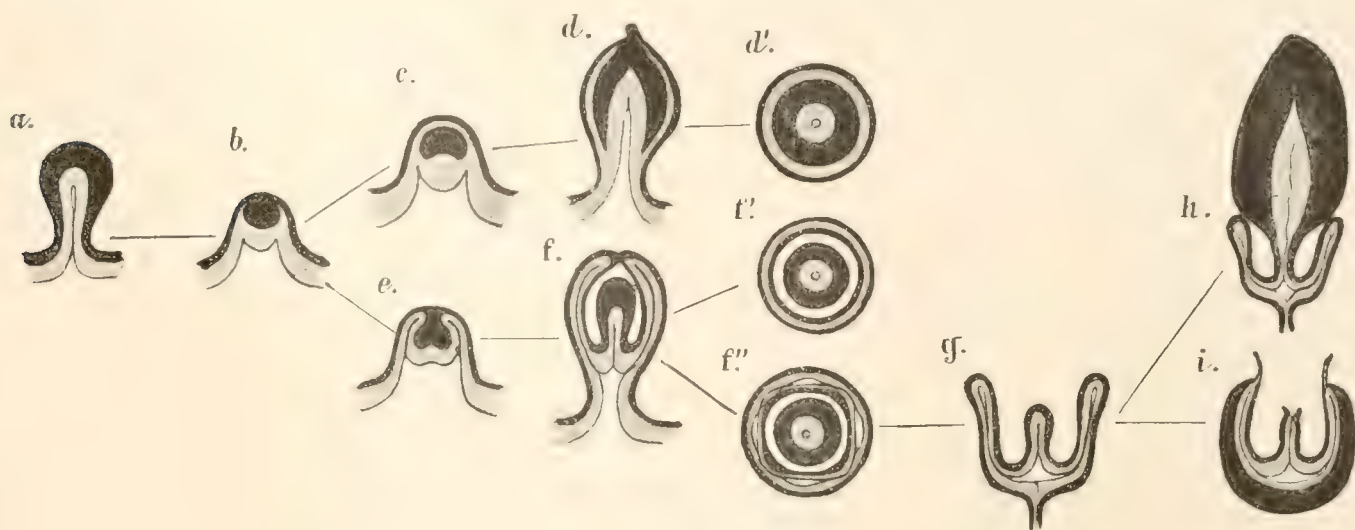
Tentacles	Gonophores	Perisarc	Genera	
Prox. filiform, dist. capitate	Medusoid	Thin, membranous	<b>Heterostephanus</b> , Allm.	A circle of tentacle-like Organs on distal portion of stem
All tentacles filiform	Stylloid	Thin, membranous	<b>Gymnogonos</b> , Bonnevie	
	Pseudo-medusoid	Thin, membranous	<b>Lampra</b> , Bonnevie	
	Medusoid	Thin, membranous	<b>Corymorpha</b> , M. Sars	
		Chitinous	<b>Tubularia</b> , Lin.	No such organs

This family is remarkable for the abundance of large, splendid species that it contains, often difficult to distinguish from one another, if the structure of the hydranths is the only thing to judge by. But while the trophosome of the various species exhibits an unusual similarity in structure, it is the reverse with the gonosomes; and all the different transitional stages between the fixed and but slightly developed gonophores, and the freeswimming medusa

lidet udviklede Gonoforer og de frit svømmende Meduser. Nedenstaaende Træsnit (Fig. 2) viser schematisk Gonoforerne forskellige Udvikling hos Arter af denne Familie.

can be better demonstrated here than in any other family. Fig. 2, below, is a diagram showing the different forms of development in different species of this family.

Fig. 2.



Schematisk fremstilling af Gonoforerne inden Fam. *Tubularidae*. *a*, *Styloid Gon.* (*Gymnog. crassicornis*); *b*, Anlæg af 'Gik' (fælles for *Medusoide* og *Pseudomedusoide Gon.*); *c, d, d'* *Pseudomed. Gonofor* (*Lampira*), (*c*, Udviklingsstadium; *d*, fuldt udviklet Gonofor; *d'*, Tversnit af samme); *e-i* *Medusoide Gonoforer*; (*e*, udv. Stad.; *f*, fuldt udviklede Gonoforer; *f'* og *f''*, Tversnit af Gonoforer uden og med Radialkanaler; *g*, Gonofor med fuldst. Kanalsystem), — Overgangsstad. til *h*, *fastsiddende*, — eller til *i*, *fri Meduse*).

Diagram of the gonophores in fam. *Tubularidae*. *a*, *Styloid gonophore* (*Gymnog. crassicornis*); *b*, rudiment of 'Gik' (common to medusoid and pseudo-medusoid gonophores); *c, d, d'*, *pseudo-medusoid gonophore* (*Lampira*); (*c*, developmental stage, *d*, fully-developed gonophore, *d'*, transverse section of the same); *e-i*, *medusoid gonophores*; (*e*, developmental stage, *f*, fully-developed gonophore, *f'*, *f''*, transverse section of gonophore without and with radial canals; *g*, gonophore with complete canal system, — transition to *h*, fixed, — or *i*, *free-swimming medusa*).

*Gymnogonos crassicornis* (29) viser det aller enkleste Forhold (*Styloide Gonoforer*), idet Gonoforerne her kun bestaar i en simpel Udbugtning af Hydranthens to Lag, og Generationsstofferne ligger her i Ektodermen, kun beskyttet af et enkelt Lag af dennes Celler.

Ingen andre af de hidtil kjendte Arter bliver staaende paa dette Stadium, men faar gennem Anlæg af „Glockenkern“ en mere kompliceret Bygning. Udviklingen gaar imidlertid fra dette Punkt i forskellige Retninger. De almindelig udbredte og vel kjendte *Medusoide Gonoforer*, hvis Anlæg det er overflødigt her at beskrive, repræsenteres ved den nedre Række af Figurer. Gonoforer uden Radialkanaler, hvor de to Entodermilag paa Snit kun viser sig som et, findes f. Eks. hos *Tubularia larynx*, medens Arter som *Tubularia obliqua*, *T. indivisa*, *T. variabilis*, *Corymorpha glacialis*, o. fl., har Gonoforer, i hvis Vægge der findes et forskelligt Antal Radialkanaler, og af hvilke nogle udvendig bærer Tentakler eller Ribber.

Paa et hoiere Udviklingstrin opnaar de medusoide Gonoforer fuldstændig Meduseform, og som Regel river de

*Gymnogonos crassicornis* (29) exhibits the very simplest conditions (*styloid gonophores*), the gonophores here consisting of only a simple evagination of the two layers of the hydranth; and the reproductive elements lie in the ectoderm, only protected by a single layer of the ectodermal cells.

No other hitherto known species stops at this stage; they all acquire, in the rudimentary „glockenkern“, a more complicated structure. From this point, however, the development proceeds in various directions. The universally-distributed, and well-known *medusoid gonophores*, whose rudimentary stage it is unnecessary to describe here, are represented by the lower row in the figure. Gonophores without radial canals, where the two endodermal layers, in section, only appear as one, are found, for instance, in *Tubularia larynx*, while the species *Tubularia obliqua*, *T. indivisa*, *T. variabilis*, *Corymorpha glacialis*, and others, have gonophores in whose walls are found a varying number of radial canals, and some of which have tentacles or ribs externally.

At a higher stage of development, the medusoid gonophores acquire a complete medusa-form, and as a rule,



sig da løs fra Kolonien, og først efter denne Adskillelse opstaar hos dem Generationsstoffer. Imidlertid findes, hos enkelte Arter, Gonoforer, med fuldstændig Medusebygning, men som, endnu medens de staar i Forbindelse med Kolonien, forsynes med Generationsstoffer; jeg tror det kan udtales som en Regel, at disse Gonoforer aldrig kommer til at løsrive sig fra sin Koloni; thi samtidig med at Generationsstofferne udvikler sig, forkrobles Meduseklokken, og Gonoforerne Rolle er udspilt, naar Yngelen har forladt den. En saadan merkelig Overgangsform mellem de frie Meduser og de fastsiddende Gonoforer, findes inden Tubularidernes Familie hos *Corymorpha sarsii*, medens Arter som *Tubularia prolifera*, *Corymorpha nutans* o. s. v. har fuldstændig frie Meduser.

Medens Gonoforerne hos alle de her nævnte Arter repræsenterer forskellige Udviklingstrin af en og samme Grundform, er de *pseudomedusoide* Gonoforer hos Slægten *Lampra* bygget efter et andet Princip. Anlægget af „Glockenkern“ er her det samme som hos de medusoide Gonoforer; men istedetfor at Ektodermindbugtningen hos disse skyver Entodermen foran sig og derved bevirker den karakteristiske Foldning af denne, saa vandrer den i *Lampra*-Arternes Gonoforer helt ind i Entodermen og paa denne Maade blir kun et enkelt Entoderm-lag liggende mellem „Glockenkern“ og Ektoderm og Muligheden for Dannelse af Radialkanaler er herved udelukket. Heller ikke sker der nogen Spaltning i to Lag blandt de indvandrede Ektodermceller, og man finder saaledes intet andet Hulrum i Gonoforerne end den smale Kanal, som strækker sig op gennem Spadix. Foruden hos alle de kjendte Arter af Slægten *Lampra*, findes saadanne Gonoforer ogsaa hos de forskellige *Myriothele*-Arter. De findes paa Figuren illustreret ved den øverste Række af schematiske Snit.

I Nordh.-Exp.'s Materiale findes af denne Fam. følgende Arter:

#### Gen. *Lampra*.

##### *Lampra sarsii*, n. sp.

(Pl. II, Fig. 3).

Foreløbig Beskrivelse, Bonnevie (29).

**Trophosome.** Hydrocaulus 8—10 cm. lang, purpurfarvet med mørke Længdestriber, og en Masse fine Hefetraade i den proximale Ende. Ingen skarp Overgang til Hydranth, som har ca. 10 proximale Tentakler, 1—2 cm. lange, og distale Tentakler i flere vel adskilte Kredse. Ca. 10 Blastostyler, 4—6 mm. lange og med et betydeligt Hulrum i hele sin Længde, danner en Kreds tæt indenfor de proximale Tentakler.

**Gonosome.** Fastsiddende pseudomedusoide Gonoforer med en rudimentær Tentakel; flere Æg udvikles i hver af dem.

they then detach themselves from the colony; and it is not until after this separation that reproductive elements appear in them. In certain species, however, there are gonophores with a complete medusa-structure, but provided with reproductive elements while still connected with the colony. I think it may be stated as a rule that these gonophores never become detached from their colony; for with the development of the generative products, there is a shrivelling of the medusa-bell, and the part of the gonophores is played out when the young have left it. A remarkable transition-form such as this between the free medusæ and the fixed gonophores, is found in the *Tubularidæ* in *Corymorpha sarsii*, while species like *Tubularia prolifera*, *Corymorpha nutans*, etc. have entirely free medusæ.

While the gonophores in all the species here named represent different stages of the development of one fundamental form, the *pseudo-medusoid* gonophores in the genus *Lampra* are constructed on another principle. The rudiment of the 'glockenkern' is the same there as in the medusoid gonophores, but whereas, in the latter, the invagination of the ectoderm pushes the endoderm before it, thus producing its characteristic folding, in the gonophores of the *Lampra* species it penetrates quite into the endoderm, and in this way, only a single endoderm layer is left between the 'glockenkern' and the ectoderm, and all possibility of the formation of radial canals is thereby excluded. Nor does any division into two layers take place among the in-wandering ectoderm cells, and thus no cavity is to be found in the gonophore but the narrow canal running up through the spadix. Gonophores of this kind are found not only in the known species of the genus *Lampra*, but also in the various *Myriothele* species. They will be found in fig. illustrated by the upper row of diagrammatic sections.

Among the hydroids from the N. Atl. Exp. the following *Tubularidæ* were found:

#### Gen. *Lampra*.

##### *Lampra sarsii*, n. sp.

(Pl. II, fig. 3).

Preliminary description, Bonnevie (29).

**Trophosome.** Hydrocaulus 8—10 cm. in length, colour purple, with dark longitudinal stripes; and a number of fine attaching filaments at its proximal end. No sudden transition to the hydranth, which has about 10 proximal tentacles, from 1 to 2 cm. in length, and distal tentacles in several clearly-marked circles. About 10 blastostyles from 4 to 6 mm. in length, forming a circle just within the ring of proximal tentacles, and with a considerable cavity extending throughout their length.

**Gonosome.** Fixed pseudo-medusoid gonophores with one rudimentary tentacle; several eggs are developed in each gonophore.

Fam. Tubularidae.

	Arter	Hydranth		Gonophorer		Hydrocaulus	Findexted	
		Prox. Tentakler	Dist. Tentakler	Stilling			Norge	Nordh - Dybde exp.
Gen. I. Heterostephanus	H. annulicornis, M. Sars. 105, 29.	Tynde 6—7 mm. lange i en Kredse	Kolle- formede. Ca. 5 i Kredse	Bæres af Blastostyler, der sidder i en Kredse indenfor prox. Tentakler	Medu- solde	Perisarc hindeagtig med Hæftetræde i den proximale Ende	Bergen — Lofoten	20—200 m.
Gen. II. Gymnogonos	G. crassicornis, Bonnevie. 29.	Tykkere med lunnen i en Kredse i 4 mm. lange	Træde- formede i flere Kredse i 4 mm. Kredse lange	Bæres af selve Hydranthen. sidder spredt mellem de to Kredse af Tentakler	Styloide Fast- siddende	1—2 cm. høj til hydranth formige Ved- hæng	Boian —	400 m.

Fam. Tubularidae.

	Species	Hydranth		Gonophores		Hydrocaulus	Where found	
		Prox. tentacles	Dist. tentacles	Position			Norway	N. Atl. Depth, m.
Gen. I. Heterostephanus	H. annulicornis, M. Sars. 105, 29.	Thin, 6 or 7 mm. in a circle	Capitate, about 5 in a circle	Upon blastostyles that are in a circle within that of proximal tentacles	Medusoid Free medusae; 4 radial canals, 1 tentacle	Perisarc membranous, with attaching filaments at the proximal end	Bergen to Lofoten	— 200
Gen. II. Gymnogonos	G. crassicornis, Bonnevie. 29.	Thick, with a lunule in a circle, 3 or 4 mm. long	Filiform, in several circles close together	Upon the hydranth itself, scattered between the two circles of tentacles	Styloid Fixed	1—2 cm. in height	Boian	400

Fam. Tubularidae.

	Blasto- styler	Gonoforer	Arter	Hydrocaulus	Hydranth			Gonosome	Fisheded	
					Prox. Tentakler	Dist. Tentakler	Bla- sto- styler		Norge	Nordh- Exp.
(Gen. III.  L a m p r a.  Traadformige Tentakler.  Hindeagtig Perisarc.  Pseudomedusoide Gonoforer	1-6 mm. lange med tydeligt Hulrum i hele sin Længde	1 rudimentær Tentakel	L. sarsii, n. sp. 29.	Purpurfarvet med mørke Længde- striber. Heltetende proximal.  Optagelser enkeltvis	Ca. 10. 10-20 mm. lange	1 flere tætsliddede Kredse.	Ca. 10	Flere Eg udvikles i hver Gonofor	St. 248	1123 m.
		Ingen Tentakel	L. atlantica, n. sp. 29.						St. 40	2222 m.
	30-40 mm. lange, meget tynde		L. purpurea, n. sp. 29.		Ca. 30. 30-40 mm. lange	To vel adskilte Kredse	Rodberget, Tromsøfjorden		St. 137	Ca. 800 m.

Fam. Tubularidae.

	Blasto-styles	Gono-phores	Species	Hydrocaulus	Hydranth			Gonosome	Where found		
					Prox. tentacles	Dist. tentacles	Bla-sto-styles		Norway	N. Atl. Exp.	Depth m.
Gen. III.  L a m p r a.  Filiform tentacles; membranous perisarc; pseudo-medusoid gonophores	4-6 mm. long, with a distinct cavity throughout its length	1 rudimentary tentacle	L. sarsii, n. sp. 29.	Solitary  Purple, with dark longitudinal stripes. Filaments proximal	About 10	In several circles, lying close together	About 10	Several eggs developed in each gonophore	---	St. 248	1423
			10-20 mm. long								
		No tentacle	L. atlantica, n. sp. 29.								
	30 or 40 mm. long; very thin		L. purpurea, n. sp. 29.		About 30, 30 or 40 mm. long	Two distinct circles			Rodberget, Tromsøfjord	St. 137	circ. 800



Denne Art, saavel som *L. purpurea*, er afbildet af Prof. G. O. Sars under Nordh.-Exp., og fra disse hans Tegninger maa enkelte Træk af Diagnoserne hentes, da de opbevarede Exemplarer er i en temmelig daarlig Forfatning. Paa en Tegning af en Blastostyl hos *L. sarsii*, ser man, at Æggene, der forlader Gonoforerne paa et meget tidligt Stadium af sin Udvikling, forbliver en Tid fæstede til disses Munding

Findested. St. 248.

### *Lampra atlantica*, n. sp.

(Pl. II, Fig. 4).

Foreløbig Beskrivelse, Bonnevie (29).

**Trophosome.** Hydrocaulus ca. 8 cm. lang, næsten jevn tyk i hele sin Længde, ca. 3 mm. i Diameter, purpurfarvet med mørke Længdestriber. Jevn Overgang til Hydranthen, som har ca. 10 proximale Tentakler, 1—2 cm. lange, og distale Tentakler i flere tættstillede Kredse. Ca. 10 Blastostyler, 4—6 mm. lange og med tydeligt Hulrum, staar i en Kreds indenfor de proximale Tentakler.

**Gonosome.** Fastsiddende pseudomedusoide Gonoforer, uden Tentakel; flere Æg udvikles i hver.

Denne Art har, som man vil se af Diagnosen, stor Lighed med *L. sarsii*; men de adskilles ved Gonoforerens Bygning, idet disse hos *L. atlantica* er aldeles glatte, medens de hos *L. sarsii* har en Tentakel, som af og til kan naa en betydelig Udvikling.

Mine Undersøgelser over Slægten *Lampras* eiendommelige Gonoforer og disses. Anlæg er gjort ved Snitserier gennem Blastostyler af denne Art, og Fig. 4, a—c, illustrerer, hvad der tidligere er udtalt herom.

Findested. St. 40.

### *Lampra purpurea*, n. sp.

(Pl. III, Fig. 1).

Foreløbig Beskrivelse, Bonnevie (29).

**Trophosome.** Hydrocaulus ca. 10 cm. lang, noget fortykkede i den proximale Ende, purpurfarvet med mørke Længdestriber. Jevn Overgang til Hydranthen, der bærer ca. 30 proximale Tentakler, 3—4 cm. lange, og distale Tentakler i to vel adskilte Kredse. Blastostyler, ca. 10, 3—4 cm. lange, meget tynde.

**Gonosome.** Fastsiddende pseudomedusoide Gonoforer, der sidder meget tæt paa de lange Blastostyler, uden nogen Tentakel. Flere Æg udvikles i hver Gonofor.

This species, as also *L. purpurea*, has been drawn by Prof. G. O. Sars during the N. Atlan. Exp. As the specimens preserved are in a rather imperfect condition, a few particulars in the definition must be taken from his drawings. In the drawing of a blastostyle of *L. sarsii*, it will be seen that the eggs, which leave the gonophores at a very early stage of their development, remain for a time attached to the mouth of the gonophores.

Locality. Station 248

### *Lampra atlantica*, n. sp.

(Pl. II, fig. 4).

Preliminary description, Bonnevie (29).

**Trophosome.** Hydrocaulus about 8 cm. in length, of an almost even thickness throughout, about 3 mm. in diameter; colour purple with dark longitudinal stripes. Gradual transition to the hydranth which has about 10 proximal tentacles from 1 to 2 cm. long, and distal tentacles in several circles standing close together. About 10 blastostyles, from 4 to 6 mm. in length, and with a distinct cavity, stand in a ring within the circle of proximal tentacles.

**Gonosome.** Fixed pseudo-medusoid gonophores, without tentacles; several eggs are developed in each gonophore.

This species, as the definition shows, bears a great resemblance to *L. sarsii*, but they are distinguished from one another by the structure of the gonophores, these being quite smooth in *L. atlantica*, while in *L. sarsii* they have one tentacle, which sometimes attains a considerable degree of development.

My examination of the peculiar gonophores of the genus *Lampra*, and their rudimentary stage, was made by means of sections of blastostyles of this species; and fig. 4, a—c, illustrates what has been previously stated about them.

Locality. Station 40.

### *Lampra purpurea*, n. sp.

Pl. III, fig. 1.

Preliminary description, Bonnevie (29).

**Trophosome.** Hydrocaulus about 10 cm. in length, somewhat thickened at its proximal end; colour purple, with dark longitudinal stripes. Gradual transition to the hydranth, which carries about 30 proximal tentacles, 3—4 cm. in length, and distal tentacles in two clearly-defined circles. About 10 blastostyles, 3—4 cm. in length, and very thin.

**Gonosome.** Fixed pseudo-medusoid gonophores, standing very close together on the long blastostyles, without tentacles. Several eggs are developed in each gonophore.

Denne Art skiller sig tydelig fra de to foregaaende, ved sine talrige og lange proximale Tentakler, saavel som ved de næsten traadformede Blastostyler, der i Længde maaler sig med Tentaklerne, og som ved sin tætte Besætning af dybt purpurfarvede Gonoforer giver denne Hydroide et sjelden pragtfuldt Udseende.

Jeg har kun havt Anledning til at undersøge Brudstykker af denne Art, men disse, i Forbindelse med Prof. Sars's Tegning af den efter levende Exemplarer, er dog nok til at skaffe et nogenlunde helt Billede af Artens Eiendommeligheder.

Findested. St. 137.

### Gen. *Corymorpha*.

#### *Corymorpha nana*, Alder (6).

(Tab. I, Fig. 7).

**Trophosome.** Hydrocaulus rørformig med hindeagtig Perisarc, bærer i den proximale Ende fine Heftetraade. Hydranthen har 15—25 proximale Tentakler, 10—15 mm. lange, og 16—18 distale i en Kreds. Blastostyler (10—15) ugrenede, danner en Kreds lige indenfor de proximale Tentakler.

**Gonosome.** Faa Gonoforer paa hver Blastostyl, udvikler sig til fri Meduser med 4 Radialkanaler og 1 fuldt udviklet Tentakel, samt 4 rudimentære.

I sin Beskrivelse over denne art omtaler Alder (47), at han har seet et enkelt Exemplar, der indenfor de proximale Tentakler har fuldt udviklede Meduser, medens alle de øvrige istedenfor disse Meduser har en Kreds af eiendommelige klumpede Legemer med forskellige Udbugtninger paa sin Overflade.

Nordh.-exp.'s Exemplar, der i sin Bygning forøvrig fuldstændig stemmer med Alders Beskrivelse af *C. nana*, bærer en Kreds af temmelig korte og tykke Blastostyler, fra hvis distale Ende Meduseknopperne anlægges. Det er ikke usandsynligt, at de omtalte uforstaaelige Legemer paa Alders Individuer, netop er saadanne ganske unge Blastostyler, paa hvis Overflade Knopperne endnu kun viser sig som Ujevnheder. En Sammenligning af Alders Illustration med min (Fig. 7 a) støtter en saadan Formodning. At Blastostylerne paa det ene Exemplar, der har Meduser, har været forsvindende i Forhold til de fuldt udviklede Medusers Størrelse, og saaledes har undgaaet Alders Opmærksomhed kan ikke overraske, da det er meget almindeligt, at Blastostylerne aftager i Størrelse, specielt i Tykkelse eftersom Gonoforerens Størrelse tiltager.

Findested. St. 261.

This species is clearly distinguished from the two preceding ones by its numerous long proximal tentacles, and by the almost filiform blastostyles, whose length equals that of the tentacles, and which, owing to the deep purple gonophores with which they are thickly covered, impart a magnificent appearance to this hydroid.

I have only had the opportunity of examining fragments this species, but these, combined with Prof. Sars's drawing of the animal from living specimens, are sufficient to give a fairly complete idea of the peculiarities of the species.

Locality. Station 137.

### Gen. *Corymorpha*.

#### *Corymorpha nana*, Alder (6).

(Pl. I, fig. 7).

**Trophosome.** Hydrocaulus tubular, with membranous perisarc; at its proximal end fine attaching filaments. The hydranth has from 15 to 25 proximal tentacles, 10—15 mm. long, and from 16 to 18 distal tentacles in a circle. From 10 to 15 blastostyles, unramified, forming a circle just within that of the proximal tentacles.

**Gonosome.** Only a few gonophores on each blastostyle; developed into free medusæ with 4 radial canals, and 1 fully developed, and 3 rudimentary tentacles.

Alder (47), in his description of this species, mentions having seen a single specimen that had fully-developed medusæ within the ring of proximal tentacles, while all the others, in their place, had a ring of peculiar tubular bodies with various lumps on their surface.

The N. Atlan. Exp. specimen, which, in other respects, agrees exactly with Alder's description of *C. nana*, has a circle of rather short, thick blastostyles, from whose distal end the medusabuds spring. It is not improbable that the above-mentioned incomprehensible bodies on Alder's specimens are merely very young blastostyles of this description, upon whose surface the buds as yet have only the appearance of surface inequalities. A comparison of Alder's illustration with mine (fig. 7 a), will bear out a supposition of this kind. It is not surprising that the blastostyles on the one specimen with medusæ were very small compared with the size of the fully-developed medusa, and have thus escaped Alder's notice, as it is very usual for the blastostyles to decrease in size, especially in thickness, as the size of the gonophores increases.

Locality. Station 261.



Fam. Tubularidae.

	Hydrocaulus	Blastostyles	Arter	Hydrocaulus	Hydranth			Gonosome		Findsted	
					Prox. Tentakler	Dist. Tentakler	Blastostyles	Kanal	Tentakler	Norge	Dyde
Gen. IV. Corymorpha. Traadformige Tentakler Hindeagtig Perisarc Medusoide Gonoforer	Hydrocaulus 5—10 cm. høi	Alternierende Smaaagrene, hver med mange Gonoforer	<b>C. nutans</b> , M. Sars. 99, 103, 14, 105.	(Optræder enkeltvis Rorformig, næsten glasklar, med hyalide Længderstriber. I proximal-Enden hel Del af Hætte-træde	15—25, 10—15 mm lange, 1 cm Kreds	Mange, i flere faststilte Rækker	15—20	Fri Meduse	1 udviklet og 3 rudimentære	Bergen — Lofoten	20—100 m.
		Kort ugrenet Stilk, gaffeldelt i Spidsen, bærer her faa, store Gonoforer	<b>C. sarsii</b> , Steenstr., 101, 110, 103, 14, 105.								
		Gonoforer over hele Overfladen, mest udviklet mod Spidsen	<b>C. glacialis</b> , M. Sars. 103, 14, 105.								
		Faa Gonoforer, paa korte, tykke Blastostyles	<b>C. nana</b> , Alder. 5, 6, 14.							Vadsø	100—300 m.

	Hydrocaulus	Blastostyles	Species	Hydrocaulus	Hydranth			Gonosome		Where found	
					Prox. tentacles	Dist. tentacles	Blastostyles	Radial canals	Tentakles	N. and Norway	Depth m.
Gen. IV. Corymorpha. Filiform tentacles; membranous perisarc; medusoid gonophores.	Hydrocaulus 5—10 cm. high 1 or 2 cm. high	Alternating small rami, each with numerous gonophores	<b>C. nutans</b> , M. Sars. 99, 103, 14, 105.	Occurrence solitary Tubular almost transparent, with white longitudinal stripes; a number of attaching filaments at the proximal end	30—50, 1.3—3 cm. long	Numerous in several rows lying close together	15—20	Free medusa	1 developed and 3 rudimentary	Bergen to Lofoten	20—100
		Short, unramified stem, forked at the point, where there are a few large gonophores	<b>C. sarsii</b> , Steenstr., 101, 110, 103, 14, 105.								
		Gonophores all over the surface, most developed towards the point	<b>C. glacialis</b> , M. Sars. 103, 14, 105.								
		Few gonophores on short, thick blastostyles	<b>C. nana</b> , Alder. 5, 6, 14.							Vadsø	100—300



Fam. Tubularidae.

Hydrophiza	Hydrocaulus	Gonosome		Arter	Hydrocaulus	Hydranth		Findested																		
		Form	Tentakler	Radial-kanaler	Arter	Hydrocaulus	Prox. Tentakler	Distale Tentakler	Blasto-tyler	Norge	Dyde															
Stærkt foretaget Hydrophiza.	Rektformig	Medusoide Gonoforer	3 (nær basis) korte, 2 radi-menter.	1	Jugen	T. variabilis, Bonnevie, 29.	3-6. Riller udkøndig	10-20; ca. 20 mm. lange	Rød- bjerged, Triljens- fjord	St. 100-900 m.																
											Jugen	Tentakler	T. indivisa, Lin. 14, 51.	1	3-10; ca. 20 mm. lange	Hede Kysten	20-200 m.									
																		Jugen	T. regalis, Boeck, 28, 14.	10-20; ca. 20 mm. lange	St. 200-313 m.					
																						Jugen	T. asymmetrica, Bonnevie, 29.	1-6 mm. lange	Rød- bjerged	?
		Flere Rør tvundet om hinanden nederst	1	Jugen	T. larynx, Ell. & Sol. 14, 44, 51.	1	Jugen	T. humilis, Allm. 14, 51.	1-10 cm. høi	Kristiania Fjord	St. 20-3000 m.															
												Jugen	T. prolifer, Agass. 1, 4, 14.	1	3-6 mm. lange	Svalvær, Nordkyn	20-60 m.									
																		Jugen	T. cornucopia, n. sp. 29.	1-2 mm. lange	Lofoten?	St. 150-400 m.				
																							Jugen	T. cornucopia, n. sp. 29.	1-2 mm. lange	St. 353-2138 m.

Gen. V.

Tubularia.

Chitinos Perisarc.

Medusoide Gonoforer.

Fam. Tubularidae.

	Hydrozoaria	Hydrocaulus	Gonosome		Species	Hydrocaulus		Hydranth		Where found	
			Form	Tentacles		Height	Prox. tentacles	Distal tentacles	Blasto-styles	Norway	N. Atl. Exp.   Depth m.
Gen. V. <b>Tubularia.</b> Chitinous perisarc; medusoid gonophores.	Much ramified	Tubular	Medusoid gonophores	Radial canals	Species	Height	Prox. tentacles	Distal tentacles	Blasto-styles	Norway	N. Atl. Exp.   Depth m.
	None	Horn-shaped	Unknown	T. cornucopia, n. sp. 29.	T. prolifer, Agass. 1, 4, 14.	Longitudinal stripping; no collar	Number, 11; length, circ. 10 mm.	2 circles of large diameter 1 or 2 mm. long	12; umbellar	St. 55	248
	Solitary	Free medusae	1	4	T. larynx, Ell. & Sol. 14, 44, 51.	Collar below the hydranth Transverse rings	Number, 20-25; length, circ. 8 mm.	2 or 3 mm. long	6-12; length, circ. 20 mm.	Kristiana and Trond- hjem Fjord	20-3000
					T. humilis, Allm. 14, 51.	No rings	Number, circ. 20; length, circ. 5 mm.		6-8; erect	Svalvar, N. Cape	20-60
					T. obliqua, Bonnievie. 29.		Number, circ. 20; length, 10 mm.		6; length, 5 or 6 mm.	Hanne- fest	?
					T. asymmetrica, Bonnievie. 29.		Number, circ. 20; length, 30 or 40 mm.	1-6 mm. long	8-16; length, circ. 20 mm.	Rød- hjerget	?
					T. regalis, Boeck. 28, 14.	Distinct longitudinal stripping. No collar beneath the hydranth	Number, 20-30; length, 15-40 mm.	2 or 3 mm. long	10-20; length, 5 mm.	—	Stations 299, 343
					T. indivisa, Lin. 14, 51.		Number, 20-30; length, circ. 10 mm.	2 or 3 mm. long	3-10; male longer than female	Entire coast	20-200
					T. variabilis, Bonnievie. 29.		Number, 25-35; length, 15 or 20 mm.		Number, 10-20; length, 20 mm.	Rød- hjerget, Trond- hjem Fjord	Stations 225, 362

**Tubularia variabilis, n. sp.**

(Tab. I, Fig. 4).

Foreløbig Beskrivelse. Bonnevie (29).

**Trophosome.** Hydrocaulus ugrenet, sammensat nederst, stiger op fra en sterkt forgrenet Hydrorhiza. Tydelig Længdestribning; ingen Krave. Hydranthen har 25—35 proximale Tentakler, ca. 2 cm. lange, og distale Tentakler i flere tætstillede Kredse; de er 2—3 mm. lange. 10—20 Blastostyler, ca. 2 cm. lange, sidder i en Kreds lige over de proximale Tentakler.

**Gonosome.** Fra Blastostylerne udvikles fastsiddende medusoide Gonoforer, forsynede med et varierende Antal Radialkanaler og med Ribber udvendig, der i Antal og Anordning svarer til Radialkanalerne.

Exemplarer af denne Art blev under Nordh.-Exp. funden paa to Stationer, begge Steder kun enkeltvis. Det ene af disse var afskaaret et Stykke nedenfor Hydranthen, men paa det andet ser man den meget sterkt forgrenede Hydrorhiza og en Samling af Stammer, som stiger op fra denne. Kun en af disse bærer Hydranth. Denne er meget stor og af en betydelig grovere Bygning end den samme hos *T. indivisa*. Dens Høide — fra Basis til Toppen af de distale Tentakler — er 12—14 mm., og Diameteren over de udspændte proximale Tentakler er ca. 50 mm.

Blastostylerne er ugrenede, ca. 2 cm. lange, med de største Gonoforer siddende distalt, og ved Basis af disse sees ofte 2—3 ganske smaa Knopper. Gonoforernes Bygning er Artens mest karakteristiske Kjendetegn, og deres eiendommelige Udseende vil strax være paafaldende. De er udvendig besat med en Del smale, høje Kamme eller Ribber, som strækker sig i Gonoforernes Længderetning og som tiltager i Høide mod deres distale Ende. De rækker et Stykke fremover denne og sænker sig derpaa brat ned mod dens Midtpunkt.

Ved Undersøgelse paa Snitserier viser det sig, at der indenfor hver Ribbe befinder sig en Radialkanal, og at Ribberne er dannet ved en Ektodermfortykkelse udenfor hver af disse Kanaler.

Medens Radialkanalernes Antal hos de øvrige Tubularider er konstant, er det hos denne Art meget variabelt. Paa samme Blastostyl har jeg saaledes fundet Gonoforer med 3 Radialkanaler, med 5 og med 6, og med et tilsvarende Antal Ribber udvendig; af disse var den Gonofor, der havde 5, videre udviklet end de øvrige, og det ser saaledes ikke ud, som om Radialkanalernes Antal stiger med Gonoforernes Alder.

I hver Gonofor udvikles en Actinula.

**Findested.** St. 325, St. 362.

Til denne Art maa sandsynligvis henføres en *Tubularia*, der ogsaa blev funden under Nordh.-Exp.; men den er saa lidt udviklet at Bestemmelsen af den bliver usikker.

Den er afskaaren et Stykke nedenfor Hydranthen, og om dens Hydrorhiza og Stilkens nedre Forløb vides

**Tubularia variabilis, n. sp.**

(Pl. I, fig. 4).

Preliminary description, Bonnevie (29).

**Trophosome.** Hydrocaulus unramified, composite below, rising from a thickly ramified hydrorhiza. Distinct longitudinal stripes, no collar. The hydranth has from 25 to 35 proximal tentacles, about 2 cm. in length, and distal tentacles from 2 to 3 mm. in length in several circles standing close together. From 10 to 12 blastostyles about 2 cm. long, stand in a ring just above the proximal tentacles.

**Gonosome.** Fixed medusoid gonophores are developed from the blastostyles, furnished with a varying number of radial canals, and with external ribs corresponding in number and arrangement with the radial canals.

During the Norw. N. Atlan. Exp., specimens of this species were found at two stations, one specimen at each. One of these was cut off a little below the hydranth, but in the other, the thickly ramified hydrorhiza is visible, and a number of stems arising from it. Only one of these carries a hydranth. This is very large, and of much coarser structure than in *T. indivisa*. Its height, from the base to the top of the distal tentacles, is between 12 and 14 mm., and the diameter across the extended proximal tentacles is about 50 mm.

The blastostyles are unramified, about 2 cm. in length with the largest gonophores situated distally, and at the base of the latter there are often two or three quite small buds. The structure of the gonophores is the most characteristic feature of the species, and their peculiar appearance will at once attract attention. They are marked externally with a few high, narrow ridges or ribs, extending in the longitudinal direction of the gonophores, and increasing in height towards their distal end. They extend a little beyond this, and then drop suddenly towards its central point.

On examination of the sectional series, it appears that within each rib there is a radial canal, and that the ribs are formed by a thickening of the ectoderm outside these canals.

Whereas the number of radial canals in the other *Tubularidae* is constant, in this species it is very variable. I have, for instance, found on one blastostyle gonophores with 3, 5 and 6 radial canals, and a corresponding number of external ribs. The gonophore that had 5 radial canals was more developed than the others, so it does not appear that the number of radial canals increases with the age of the gonophore.

In each gonophore an actinula is developed.

**Locality.** Station 325, Station 362.

It is probably to this species that a *Tubularia*, also found during the N. Atlan. Exp., but so little developed that its identification is uncertain, must be referred.

It has been cut off a little below the hydranth, and thus nothing is known of its hydrorhiza and the lower



saaledes intet. Den øverste Del har Længdestribning som *T. variabilis*.

Hvad Hydranthen angaar stemmer Tentaklernes Størrelse og Anordning med Diagnosen for nævnte Art, og Gonoforerne har 6—7 Radialkanaler; hvorvidt de har Ribber eller ikke kan ikke afgjøres, da deres Udvikling er saalidet fremskreden.

Blastostylernes Bygning og Størrelse synes at være noget afvigende, idet de danner korte, tætte Klaser, der ikke naar længer end til Enden af de distale Tentakler; det er dog muligt, at dette Forhold senere, under Gonoforernes videre Udvikling vil forandres.

**Findested.** St. 343.

### *Tubularia regalis*, Boeck (28).

(Tab. I, Fig. 5).

**Trophosome.** Hydrocaulus ugrenet, viser Længdestribning; ingen Krave. Hydranthen har 20—30 proximale Tentakler, 2—4 cm. lange, og distale i flere tætstilte Rækker. 10—20 ugrenede Blastostyler, 3.5 cm. lange, danner en Kreds lige indenfor de proximale Tentakler.

**Gonosome.** Fastsiddende medusoide Gonoforer uden Radialkanaler. Tentakler eller Ribber.

Denne Art, som tidligere er beskrevet af *Boeck* efter et Exemplar fra Spitsbergen, er under Nordh.-Exp. fundet paa to Stationer og i Exemplarer, der i Størrelse endog overgaar *Boecks* Exemplar. Ingen af dem er helt fuldstændige, da Stilken er afreven ovenfor Hydrorhiza. *Boeck* har heller ikke givet nogen Beskrivelse af denne; jeg anser det dog for sandsynligt, at den er forgrenet og at flere Stilke er tvundet om hinanden nederst, da Hydrocaulus, som øverst er lys og temmelig hyalin, og har en Diameter af 3—4 mm., smalner af mod den proximale Del og samtidig blir mørkere og mindre gjennemsigtig, hvad der ogsaa er Tilfældet hos *T. indivisa* og andre Arter, hvis Hydrocaulus er sammensat i sit nedre Forløb. Paa et Par af Nordh.-Exp.'s Exemplarer har den afrevne Stilk en Høide af over 20 cm., og det er ikke usandsynligt, at den naar op til ca. 30 cm. Med sine prægtige Hydranther, der maaler 7—9 cm. over de proximale Tentakler, og hvis Blastostyler er næsten lige lange som disse, blir vel *Tubularia regalis* staaende som Slægtens første Representant med Hensyn paa Størrelse og vakker Bygning.

**Findested.** St. 290, St. 343.

### *Tubularia larynx*, Ell. & Sol.

**Trophosome.** Hydrocaulus rørformig, forgrenet, udgaar fra en krybende, sterkt forgrenet Hydrorhiza, forekommer i store Kolonier; men de enkelte Rør er adskilte helt ned. Ringe findes paa enkelte Partier af Hydrocaulus, og den er under Hydranthen udvidet til et Slags Krave.

course of the stem. Its upper parts is longitudinally striped like *T. variabilis*.

As regards the hydranth, the size and arrangement of the tentacles agree with the definition of the above-named species, and the gonophores have 6 or 7 radial canals. Whether they have ribs or not cannot be determined, as their development is so very slight.

The structure and size of the blastostyles appear to be somewhat different, as they form short, thick clusters, which reach no farther than the end of the distal tentacles; it is, however, possible that this may alter later on during the further development of the gonophores.

**Locality.** Station 343.

### *Tubularia regalis*, Boeck (28).

(Pl. I, fig. 5).

**Trophosome.** Hydrocaulus unramified, exhibiting longitudinal striping; no collar. The hydranth has from 20 to 30 proximal tentacles, 2—4 cm. long, and several close rows of distal tentacles. From 10 to 20 unramified blastostyles, 3.5 cm. long, form a circle just within that of the proximal tentacles.

**Gonosome.** Fixed medusoid gonophores, without radial canals, tentacles or ribs.

This species, which has previously been described by *Boeck* from a specimen from Spitsbergen, was found during the N. Atlan. Exp. at two stations, the specimens being even larger than that of *Boeck*. None of them are quite perfect, as the stem has been broken off above the hydrorhiza, nor has *Boeck* given any description of the hydrorhiza. I think it probable, however, that it is ramified, and that several stems are twisted round one another at the bottom, as the hydrocaulus, whose upper part is light and rather hyaline, and is 3 or 4 mm. in diameter, tapers towards its proximal part, at the same time becoming darker and less transparent, as is the case in *T. indivisa* and other species where the lower part of the hydrocaulus is composite. In two or three of the N. Atlan. Exp. specimens, the length of the broken stem is more than 20 cm., and it is not improbable that it attains a length of about 30 cm. With its splendid hydranths, measuring from 7 to 9 cm. beyond the proximal tentacles, *T. regalis* will always rank as the first representative of the genus as regards size and beauty of form.

**Locality.** Station 290, Station 343.

### *Tubularia larynx*, Ell. and Sol.

**Trophosome.** Hydrocaulus tubular, ramified, springing from a creeping, much ramified hydrorhiza; occurring in large colonies, but each tube separate to the very bottom. Rings are found on some parts of the hydrocaulus, which expands below the hydranth to a sort of collar.

Hydranthen har 20—25 proximale Tentakler, ca. 8 mm. lange, og distale Tentakler i flere tæstillede Rækker. 6—12 ugrenede Blastostyler.

**Gonosome.** Fastsiddende medusoide Gonoforer, uden Radialkanaler, men med 4 rudimentære Tentakler.

**Findested.** St. 52, St. 267. Reykjavik.

### ***Tubularia prolifer*, Agassiz.**

(Tab. I, Fig. 6).

Syn.: ***Hybocodon prolifer***, Agas. (4).

Syn.?: *T. simplex*, Alder, G. O. Sars (97).

**Trophosome.** Hydrocaulus ugrenet, rørformig, udgaar fra forgrenet Hydrorhiza; optræder enkeltvis. Længdestribning, ingen Krave. Høide ca. 5 cm. Hydranthen har 14 proximale Tentakler og distale Tentakler i to vel adskilte Kredse. 8 Blastostyler sidder i en Kreds omtrent midt mellem de proximale og distale Tentakler.

**Gonosome.** Fri Meduse med 4 Radialkanaler og 1 sterkt udviklet Tentakel, der ved sin opsvulmede Basis viser Anlæg til 4 nye Meduser, allerede førend den første har løsrevet sig.

Denne Art er beskrevet af *Agassiz*, som ogsaa har givet en Række meget karakteristiske Afbildninger af den: men den er hidtil ikke funden paa den europæiske Side af Atlanterhavet.

Dens Trophosome ligner noget *Tubularia larynx*, men dens Hydrocaulus viser en svag Længdestribning istedenfor Ringe hos *T. larynx*, og dens Optræden er ganske forskjellig, idet den som Regel optræder alene — efter *Agassiz* skal det dog kunne forekomme at flere udgaar fra samme Hydrorhiza. — Hydranthen har, selv om Blastostylerne ikke er udviklet, et karakteristisk Kjendemerke i Anordningen af de distale Tentakler i to vel adskilte Kredse. Men det mest eiendommelige ved denne Art er dog Blastostylerne med de fra dem anlagte Meduser.

Blastostylerne danner en tæt Kreds omkring Midten af Hydranthen i en betydelig Afstand fra Kredsen af de proximale Tentakler. De er forgrenede og de enkelte Grene deler sig som Regel skjærmformig i tre eller fire Smaagrener, der hver bærer en Meduse. Paa det af mig undersøgte Exemplar er ingen Meduser fuldt udviklede, og de danner med sin ene sterkt opsvulmede Tentakel, som i Størrelse næsten kan maale sig med hele den øvrige Del af Medusen, en meget paafaldende Figur. Man ser tydelig de fire Radialkanaler, af hvilke en. — den som fortsattes i Tentaklen, — betydelig overgaar de andre i Udvikling; og man kan se Manubriet, der, endnu uden nogen Mundaabning, rager frem over Klokkeranden. Ved Basis af Tentakelen — lidt nedenfor dens tykkeste Parti — ser man 4 Knuder, symmetrisk anordnet i Par paa begge Sider af Tentakelens Midtlinie, de proximale er smaa, ægformige, medens de to Distale er større og af en uregelmæssig Bygning. Det viser sig ved Suitsierier, at disse Knuder er

The hydranth has from 20 to 25 proximal tentacles, about 8 mm. long, and several closely-disposed rows of distal tentacles. From 6 to 12 unramified blastostyles.

**Gonosome.** Fixed medusoid gonophores, without radial canals, but with 4 rudimentary tentacles.

**Locality.** Station 52, Station 267; Reykjavik.

### ***Tubularia prolifer*, Agassiz.**

(Pl. I, fig. 6).

Syn.: ***Hybocodon prolifer***, Agas. (4).

Syn.?: *T. simplex*, Alder, G. O. Sars (97).

**Trophosome.** Hydrocaulus unramified, tubular, springing from ramified hydrorhiza; occurrence solitary; longitudinal striping, no collar; height about 5 cm. The hydranth has 14 proximal tentacles, and two distinct circles of distal tentacles. Eight blastostyles in a circle about midway between the proximal and the distal tentacles.

**Gonosome.** Free-swimming medusa with 4 radial canals and 1 highly-developed tentacle, which exhibits, at its swollen base, the bud-rudiments of 4 new medusæ, even before the first has become detached.

This species is described by *Agassiz*, who has also given a series of very characteristic illustrations of it; but it has not hitherto been found on this side of the Atlantic.

Its trophosome somewhat resembles that of *Tubularia larynx*, but its hydrocaulus exhibits a faint longitudinal striping, in place of the rings in *T. larynx*. Its occurrence is also quite different, as it is generally solitary, although, according to *Agassiz*, several may sometimes spring from one hydrorhiza. The hydranth has a characteristic distinguishing feature, even if the blastostyles are not developed, in the arrangement of the distal tentacles in two distinct circles; but the most peculiar feature of this species is the blastostyles with their rudimentary medusæ.

The blastostyles form a thick ring around the middle of the hydranth, at a considerable distance from the ring of proximal tentacles. They are ramified, and each ramus, as a rule, divides, in the form of an umbel, into 3 or 4 small branches, each bearing a medusa. On the specimen examined by me none of the medusæ are fully developed; and with their solitary greatly swollen tentacle, which is nearly equal in size to the whole of the medusa, they have a very strange appearance. The 4 radial canals are distinctly visible, one of them — that of which the tentacle is a continuation — considerably surpassing the others in development. The manubrium is also visible, projecting, as yet without any oral aperture, beyond the edge of the bell. At the base of the tentacle, a little below its thickest part, 4 processes are to be seen, symmetrically arranged in pairs on each side of the median line of the tentacle; the proximal processes are small and oviform, while the two distal ones are larger, and of an irregular structure. From the



Knopanlæg til nye Meduser, og paa de største ser man endog, hvorledes den ene Radialkanal er sterkere udviklet end de øvrige, og man ser i dens distale Væg — hvor den nye Meduses Tentakel vil opstaa — Fortykkelser, der er det første Anlæg til tredje Generation af Meduser.

Hvor langt disse forskjellige Generationer er kommen, idet Modermedusen løsriver sig, har jeg ikke havt Anledning til at undersøge; men jeg fandt i April 1897 blandt Plankton i Kristianiafjorden en Mængde smaa Medusekolonier, der uden Tvivl skriver sig fra denne Hydroide. Hos de fleste af disse havde Modermedusen ganske mistet Evnen til at svømme; dens Manubrium var meget sterkt udviklet, omtrent dobbelt saa langt som Klokken, der viste Tverrynker og som i sin forkroblede Tilstand tydede paa, at denne første Generation af Meduserne snart skulde gaa sin Opløsning imøde. Manubriet smalnede af mod Mundaabningen til et Rør og havde yderst en omboiet Kant; et Stykke ovenfor Munden — men udenfor Klokkeranden — saaes et fortykket Belte, der ved Undersøgelse paa Snit viste sig at være Sædet for Generationsprodukter.

Svømningen blev paa dette Stadium besorget af anden Generations Meduser, og deres Tentakler var atter Sæde for en Række af senere Generationer paa de forskjelligste Udviklingstrin.

**Findested.** St. 150.

G. O. Sars omtaler (97) at han et Par Gange har fundet *Tubularia simplex*, Alder, udenfor Lofoten paa indtil 200 Favnes Dyb. Jeg anser det ikke for urimeligt, at dette har været *T. prolifer*, da denne under Nordh.-Exp. blev fundet omtrent ved samme Sted og paa lignende Dyb, og da disse Arter vilde være meget vanskelige at holde ud fra hinanden, naar Blastostylerne ikke er tilstede. Da disse overhovedet ikke er iagttaget hos *T. simplex*, er det meget muligt, at denne vil vise sig at være identisk med *T. prolifer*.

### ***Tubularia? cornucopia*, n. sp.**

(Tab. II, Fig. 1).

Foreløbig beskrevet, Bonnevie (29).

**Trophosome.** Ingen Hydrorhiza. Hydrocaulus hornformet med Spidsen nedad, festet til Stene eller Skjælfragmenter, blank, sterkt gulfarvet uden Ringe eller Stribning. En stor gennemskinnelig Krave, ca. 10 mm. hoi, afslutter Perisarcen opad. Hydranthen har 30 proximale Tentakler, ca. 3 cm. lange, og distale, 2 mm. lange, i flere tættstillede Kredse. Dens Diameter tiltager mod den distale Ende, størst ved Mundaabningen. 12 eiendommelig skjærmformede Blastostyler danner en Kreds tæt indenfor de proximale Tentakler.

**Gonosome.** Anlæg som hos de øvrige Tubularider; videre Udvikling ukjendt.

sectional series it appears that these processes are the rudimentary buds of new medusæ; on the largest it can even be seen how one radial canal is more highly developed than the others, and in its distal wall, at the place whence the new medusa's tentacles will spring, thickenings are visible, which are the earliest rudiments of the third generation of medusæ.

How far these different generations have advanced by the time the parent medusa becomes detached, I have had no opportunity of observing; but in April, 1897, I found among the plankton in the Kristiania Fjord, a number of small medusa colonies, which were without doubt derived from this hydroid. In most of them, the parent medusa had quite lost the power of swimming; its manubrium was very highly developed, being about twice the length of the bell which exhibited transverse corrugations, and by its shrivelled condition, indicated that this first generation of medusæ were approaching their dissolution. The manubrium was narrowed towards the oral aperture to a tube, its edge being deflexed at the extreme end; a little above the mouth, but beyond the edge of the bell, there was a thickened zone, which on examination in section, proved to be the seat of the generative products.

The swimming at this stage was effected by the medusæ of the second generation, and their tentacles again were the domicile of a series of younger generations in the most varied stages of development.

**Locality.** Station 150; off Bodø.

Prof. G. O. Sars says (97) that he has found *Tubularia simplex*, Alder, two or three times off Lofoten, at various depths up to 200 fathoms. I think it is not improbable that this was *T. prolifer*, as the latter was found during the N. Atlán. Exp. at about the same place, and at similar depths, and as it would be very difficult to distinguish the two species from one another, if there were no blastostyles. As these have not been observed at all in *T. simplex*, it is very possible that this species will prove to be identical with *T. prolifer*.

### ***Tubularia? cornucopia*, n. sp.**

(Pl. II, fig. 1.)

Preliminary description, Bonnevie (29).

**Trophosome.** No hydrorhiza. Hydrocaulus horn-shaped, with the point downwards, attached to stones or fragments of shell; shining, of a bright yellow colour, without rings or stripes. A large translucent collar, about 10 mm. in height, terminates the perisarc above. The hydranth has 30 proximal tentacles, about 3 cm. long, and several dense rows of 2 mm. long distal tentacles. Its diameter increases towards its distal end, being greatest at the oral aperture. Twelve peculiar umbellar blastostyles form a circle just within that of the proximal tentacles.

**Gonosome.** Rudiment as in the other *Tubularidae*; subsequent development unknown.



Denne nye Art afviger i mange Retninger fra alle tidligere kjendte Arter, og den maa ubetinget indtage en Grænsestilling inden Slægten *Tubularia*, hvis den overhovedet skal indordnes under nogen tidligere kjendt Genus. Da dens Gonosome kun er meget utilstrækkelig kjendt, anser jeg det dog ikke for rimeligt her at give den nogen Særstilling. Den chitinoe Perisarc og dens traadformige Tentakler, stillet i to Kredse, fører den ind under Slægten *Tubularia*, medens dens solitære Optræden og dens Mangel paa Hydrorhiza tyder paa Slægtskab med *Corymorpha*, og denne Art danner saaledes, sammen med *T. prolifer* — oftest solitær Optræden, og Meduse med en Tentakel — Overgangsformer mellem de to nævnte Slægter.

Hydrocaulus har øverst en Diameter af ca. 5 mm., og den smalner jævnt af nedover indtil den nederst løber ud i en ganske fin Spids, hvormed den paa de to af mig undersøgte Exemplarer var fæstet til et haardt Underlag (en Sten og Stykke af et Serpularør). Samtidig med denne Afsmalnen bugter Hydrocaulus sig sterkt, saa at den i hele sin Bygning minder paafaldende om et Horn. Perisarcen er sterkt gulfarvet og aldeles blank. Eiendommelig er ogsaa den store Krave, som danner Perisarcens Afslutning opad, og fra hvis Bund den ubedækkede Coenosarc stiger op.

Hydranthen er skarpt adskilt fra Stilken, og dens Bygning afviger fra det almindelige Forhold hos *Tubulari*-derne, idet dens Diameter, som er ganske liden mellem de proximale Tentakler, tiltager mod den distale Ende, saa at den ved Mundaabningen naar op til 8—10 mm. Tentaklernes Bygning og Anordning stemmer overens med de øvrige Arter.

Blastostylerne er derimod hos denne Art omdannet paa en Maade, der saavidt mig bekjendt, ikke har Sidestykke hos nogen anden Hydroide. Jeg har kun havt Anledning til at undersøge dem paa et tidligt Stadium af deres Udvikling, og det er meget muligt, at deres Form i udvoxet Tilstand ikke vil stemme med min Beskrivelse af dem; men de afviger i sit Anlæg saameget fra Blastostylerne hos de øvrige *Tubulari*der, at de neppe nogensinde vil miste sin Eiendommelighed. Blastostylernes Kreds omkring Hydranthen er saa tæt, at de synes at danne en kompakt Ring om den, med en nogenlunde jevn Overflade. Ved at undersøge de enkelte Blastostylers Bygning ser man, at de dannes af en meget kort Stilk, der i sin distale Ende er skjærmformig forgrenet, og at hver af de 4—5 Grene strax breder sig ud til et kugleformigt eller ovalt Legeme, hvis Overflade overalt undtagen lige ved Stilken, er besat med smaa runde Forhøininger. Jeg har ved Snitserier undersøgt Bygningen af disse eiendommelige Dannelser, og det viser sig, at hver af disse Smaagrener, der udgik skjærmformig fra Moderstilken, meget snart selv danner en Skjærm bestaaende af en Mængde fine Forgreninger, der udgaar fra omtrent samme Punkt. At man ikke kan se denne anden Forgrening kommer af, at Ektodermen fortykkes mellem Grenene og ganske udfylder Rummet mellem dem. Gonoforerne anlægges i den distale Ende af alle disse fine Grene, og man ser dem udvendig

This new species differs in many ways from all previously known species, and must certainly occupy a border position within the genus *Tubularia*, if it is to be classed under hitherto known genus. As its gonosome however, is only very imperfectly known, I do not consider it would be right to give it any peculiar position. Its chitinous perisarc, and its filiform tentacles, standing in two circles, entitle it to a place in the genus *Tubularia*, while its solitary occurrence and absence of hydrorhiza indicate an affinity with *Corymorpha*, so that this species, together with *T. prolifer* — generally of solitary occurrence, and having a medusa with one tentacle — are transition forms between the two above-named genera.

In its upper part, the hydrocaulus has a diameter of about 5 mm., and tapers gradually downwards until it ends at the bottom in quite a fine point, with which, in the two specimens examined by me, it was attached to a hard substratum (a stone and pieces of a *Serpula* tube). Simultaneously with this tapering, the hydrocaulus curves sharply, and thus acquires a striking resemblance to a horn. The perisarc is bright yellow, and quite smooth. The large collar, too, which terminates the perisarc above, and from the bottom of which the uncovered coenosarc rises, is peculiar.

The hydranth is distinctly marked off from the stem, and its structure differs from the ordinary conditions in *Tubulari*de, its diameter, which is quite small between the proximal tentacles, increasing towards the distal end, until, at the oral aperture, it attains a diameter of from 8 to 10 mm. The structure and arrangement of the tentacles is similar to those of the other species.

The blastostyles in this species, on the other hand, are transformed in a manner that is, as far as I know, without parallel in any other hydroid. I have only had an opportunity of examining them at an early stage of their development, and it is very possible that their form in a fully developed condition will not agree with my description of them; but they differ so greatly in their rudimentary stage from the blastostyles in other *Tubulari*de that they can hardly entirely lose their individuality. The blastostyles in the circle round the hydranth stand so close, that they appear to form a compact ring with a fairly even surface. An examination of the structure of the separate blastostyles shows that they each consist of a very short stem, ramified in the form of an umbel at its distal end, and that each of the 4 or 5 rami immediately expand into a spherical or oval body, whose entire surface, with the exception of the part close to the stem, is covered with small round elevations. I have examined the structure of these peculiar formations in a series of sections, and it appears that each of the small rami branching in an umbel from the lower stem, very soon itself forms an umbel, consisting of a number of fine ramifications, starting from about the same point. The reason why this second ramification cannot be seen is that the ectoderm is thickened between the rami, and quite fills up the intervening spaces. The gonophores spring from the

som de omtalte Forhøininger, der dækker Ektodermhudens Overflade.

Findested. St. 353.

### Fam. Myriothelidae.

Siden Opdagelsen af *M. phrygia*, den tidligst kjendte Art af denne eiendommelige Familie (den blev beskrevet først af *Fabricius*, som *Lucernaria phrygia* og senere af *M. Sars* som *Myriothela arctica*), er der fremkommet forskellige Forslag angaaende dens Stilling i Systemet. *Alder* vilde placere den blandt *Tubularidae*, paa Grund af dens Lighed med *Acaulis*; *Allman* sluttede sig til denne Synsmaade ogsaa paa Grund af den Lighed, som findes mellem *Myriothela* og *Tubularia*-Arter, derved at begge Slægter i sin Udvikling mangler det sværmende Stadium; (Larverne har allerede naar de kommer ud af Gonoforen antaget den unge Hydroides Form, og sætter sig meget snart fast for at danne en ny Koloni). *Hincks* (50) protesterer mod denne Sammenstillingen, og gjør opmærksom paa den Eiendommelighed hos *Myriothela*, at dens Gonoforer bæres af coryneformige Polyper, uden Mundaabning, i Lighed med Blastostylerne hos *Hydractinia* og *Dicoryne*. Han opfatter derfor *Myriothela* som „a cluster of polypites nearly related to *Coryne*“; men paa Grund af dens Eiendommeligheder lader han den staa som Typen for en egen Familie.

*Schneider* kalder *Myriothela* „ein echter Corynide“, og siger, at hvis Gonoforbærerne skal tydes som Corynelignende Polyper, da er *Myriothela* en forgrenet, og ikke, som man før har ment, en solitær Form, og med Blastostylerne siddende paa Stammen.

Man troede længe, at de forskellige Beskrivelser af *Myriothela* alle omhandlede en og samme Art, indtil *G. O. Sars* (97) paaviste, at den af de britiske Zoologer undersøgte Art er en anden end den oprindelige, af *Fabricius* og *M. Sars* beskrevne *Myriothela phrygia*, og at Arterne skiller sig ved sin Tilheftningsmaade og ved Blastostylernes Form.

Den Form, som de britiske Forskere nærmest har undersøgt er *Myriothela cocksii*, der har en pladeformig udbredt Hydorrhiza, dækket af chitinos Perisarc, og dens proximale Del kan muligens betragtes som en Hydrocaulus<sup>1</sup> paa hvilken de halvt atrophierede Hydranth (Blastostyler) sidder, medens kun en Hydranth — den terminale — er fuldt udviklet, og denne overgaar langt de øvrige i Størrelse. *M. phrygia* derimod har ingen Hydrocaulus, ingen Perisarc og kun svagt udviklet Hydorrhiza — hele Kolonien repræsenteres ved en eneste, ofte enormt udviklet, Hydranth, paa hvilken Blastostylerne sidder indimellem Tentaklerne.

<sup>1</sup> Jeg har ikke havt Anledning til selv at undersøge denne Art, og kan saaledes ikke bestemt udtale mig om dens Bygning.

distal end of all these fine rami, and are visible externally in the form of the above-mentioned elevations, covering the surface of the ectoderm cushion.

Locality. Station 353.

### Fam. Myriothelidae.

Since the discovery of *M. phrygia*, the earliest known species of this peculiar family (described first by *Fabricius* as *Lucernaria phrygia*, and subsequently by *M. Sars* as *Myriothela arctica*), several suggestions have been made as to its position in the system. *Alder* wished to place it among *Tubularidae*, on account of its resemblance to *Acaulis*, and *Allman* shared his view, not only on this account, but also because of a resemblance between species of *Myriothela* and *Tubularia*, in the absence of the swimming stage in the development of both genera, as the larvæ, by the time they emerge from the gonophores, have assumed the form of the young hydroid, and very soon become fixed in order to form a new colony. *Hincks* (50) protests against this classification, and draws attention to a peculiarity in *Myriothela*, namely, that its gonophores are carried by *Coryne*-shaped polyps without oral aperture, resembling the blastostyles in *Hydractinia* and *Dicoryne*. He therefore looks upon *Myriothela* as „a cluster of polypites nearly related to *Coryne*“; but on account of its peculiarities, he allows it to stand as the type of a separate family.

*Schneider* calls *Myriothela* „ein echter Corynide“, and says that if the bearers of the gonophores are to be interpreted as *Coryne*-like polypites, *Myriothela* is ramified, with the blastostyles on the stem, and not, as has hitherto been thought, a solitary form.

It was long thought that all the various descriptions of *Myriothela* treated of one and the same species, until *G. O. Sars* (97) proved that the species examined by the British zoologists differs from the original *Myriothela phrygia* described by *Fabricius* and *M. Sars*, and that the species were distinguished from one another by the manner in which they were attached, and by the shape of the blastostyles.

The form that has been most thoroughly examined by British naturalists is *Myriothela cocksii*, which has a lamelliform expansion of the hydorrhiza, covered by a chitinous perisarc, and a proximal part that may possibly be regarded as a hydrocaulus<sup>1</sup>, upon which are the semi-atrophied hydranths (blastostyles) while only one hydranth, the terminal one — which far surpasses the others in size — is fully developed. *M. phrygia* on the other hand, has no hydrocaulus, no perisarc, and only a feebly developed hydorrhiza. The entire colony is represented by a single, often enormously developed hydranth, on which the blastostyles and the tentacles stand intermingled.

<sup>1</sup> I have had no opportunity of examining this species myself, and cannot therefore make any decided statement as to its structure.



Under Nordh.-Exp. er *Myriothela*-Arternes Antal forøget, og en Sammenstilling af alle Arter giver det Indtryk, at *M. cocksii* danner en Grænseform, der antyder, at hvilken Vei en *Coryne* har kunnet udvikle sig til en *Myriothela*. Har man f. Ex. en Form som *C. gigantea*<sup>1</sup>, men forenet, istedenfor som denne at være solitær, saa kan man tænke sig Overgangen til *M. cocksii* skeet ved, at alle Hydranther paa en nær atrophieres, gaar over til at være Blastostyler, medens den ene Hydranth kun staar i Ernærings Tjeneste. Disse Overgangsformer mangler imidlertid fuldstændig, og jeg finder Spranget saa stort, og *Myriothela*-Arternes Eiendommeligheder saa sterkt udviklede, at de bør staa som en egen Familie.

*Hincks's* Sammenligning af *Myriothela* med en Koloni af *Hydractinia* bringer den Tanke nær, at man hos *Myriothela* har en Rhizocaulomdannelse, i Lighed med hvad man finder hos *Perigonimus* og *Lafoëa*, og at Blastostylerne udgaar fra Rhizocaulomet istedetfor som hos *Hydractinia* at udgaa fra den krybende Hydrorhiza.

En nærmere Undersøgelse af *Myriothelas* Entoderm har imidlertid vist, at den fordøiende Hulhed fortsætter uden Afbrydelse lige til dens Basis og at Strukturen er fuldstændig den samme ogsaa i den nederste Del, der bærer Blastostylerne, og dette har bragt mig til at betragte det hele som en eneste Hydranth. At Blastostylerne har sin Plads paa selve Hydranthen er en Eiendommelighed, som vi træffer endnu mere udpræget hos *Tubulariderne*, idet de her har sin Plads indenfor Kredsen af de proximale Tentakler, og er omdannede i en saadan Grad, at man vanskelig vil erkjende dem som Blastostyler, hvis man ikke havde en Række af Mellemlidder der viser deres Oprindelse.

*G. O. Sars* foreslaar, at den britiske Form skal beholde navnet *Cocksii*, det Artsnavn, den fik af sin Opdager *Vigurs*. Senere (105, Anm.) foreslaar han ogsaa at stille de to oprindelige Arter i hver sin Slægt, *Myriothela* (Sars) og *Spadix* (Gosse), et Forslag, som jeg ved min foreløbige Meddelelse gav min Tilslutning. Efter den Tid har jeg imidlertid undersøgt et stort Materiale Hydroider og ved Betragtning af de Variationer, som forekommer indenfor Slægter af andre Familier, er jeg kommen til det Resultat, at forskjellen mellem de to Arter ikke er saa indgribende, at den berettiger deres Adskillelse i forskellige Slægter. Blandt de Hydroider jeg har havt til Undersøgelse, findes mindst 4 nye Arter af Slægten, og vi har altsaa nu: Fam. *Myriothelidae* repræsenteret ved 1 Slægt, *Myriothela*, inden hvilken der kjendes 6 forskellige Arter.

Fælles for disse Arter<sup>2</sup> er det, at de fuldstændig mangler Hydrocaulus, dermed ogsaa Perisarc, og at Blastostylerne har sin Plads paa Hydranthenes nederste Del. Deres Hydrorhiza optræder under tre forskellige Former, enten 1) pladeformig udbredt paa Underlaget, med chitinos Overtræk, eller 2) som tentakelformige Heftetraade,

During the N. Atl. Exp. the number of species has been greater, and through a comparison of all the species it seems, that *M. cocksii* stands as a transition-form, indicating the way in which a *Coryne* form has been able to develop into a *Myriothela*. If, for instance, we have a form like *C. gigantea*<sup>1</sup>, but ramified instead of being solitary as the latter is, we can imagine the hydranths but one being atrophied, and turning into blastostyles, while the one hydranth only acts in the service of nutrition. These transition-forms, however, are altogether wanting, and I consider the break to be so great, and the peculiarities of the *Myriothela* species so highly developed, that they ought to stand as a separate family.

*Hincks's* comparison of *Myriothela* with a colony of *Hydractinia* suggests the thought that in *Myriothela* we have a rhizocaulom formation similar to that found in *Perigonimus* and *Lafoëa*, and that the blastostyles spring from the rhizocaulom instead of, as in *Hydractinia*, from the creeping hydrorhiza.

A closer examination of *Myriothela's* endoderm, however, has shown that the digestive cavity continues without interruption right to the base, and that the structure is exactly the same in the lower portion, which bears the blastostyles; and this has led me to consider the whole as a peculiarity that we meet with in a yet more marked degree in the *Tubularidae*, as there they are within the circle of proximal tentacles, and are transformed to such an extent, that it would be difficult to recognise them as blastostyles, if there were not a series of intermediary links which show their origin.

Prof. *G. O. Sars* suggests that the British form shall retain the name *cocksii*, the specific name it received from its discoverer *Vigurs*. Subsequently (105, note), he suggests placing the two originally known species each in a separate genus, as *Myriothela*, Sars, and *Spadix*, Gosse, — a proposal I supported in my preliminary account (29) of some of the N. Atlan. Exp. species. Since that time, however, I have examined a large number of hydroids, and on considering the variations which occur within genera of other families, I have come to the conclusion that the difference between the two species is not so important as to justify their division into different genera. Among the hydroids I have examined, there are at least 4 new species of the genus, and we have now, therefore, Fam. *Myriothelidae*, represented by 1 genus, *Myriothela*, in which 6 different species are known.

As characteristics common to all these species<sup>2</sup> we have, first, the total absence of hydrocaulus, and with it the perisarc, and second, that the blastostyles are situated on the lower portion of the hydranth. Their hydrorhiza makes its appearance in three different forms, 1) lammelliformly expanded on the sub-stratum with a chitinous

<sup>1</sup> Se Pag. 14, og Bonnevie „Neue norwegische Hydroiden“, 1898.

<sup>2</sup> Undt. muligens *M. cocksii*.

<sup>1</sup> See p. 15, and Bonnevie „Neue norwegische Hydroiden“, 1898.

<sup>2</sup> Except perhaps *M. cocksii*.



der udgaar fra Hydranthens afrundede Basis, eller endelig 3) rodformig tilspidset og besat med fine Hefetraade. De to første af disse Former for Hydorrhiza forudsætter et nogenlunde fast Underlag, medens de Arter, der har den tilspidsede Rod med tynde Hefetraade, sandsynligvis findes staaende i blød Sandbund.

Hvad *Myriothelas* Struktur og Udvikling angaar, saa viser de — efter *Allmans* (16) og *Korotneff's* (72—73) indgaaende Undersøgelser, — mange Eiendommeligheder. Disse Undersøgelser gjælder Arten *M. coxsi*, der i væsentlige Punkter afviger fra de øvrige Arter, — saaledes ogsaa ved Besiddelsen af de eiendommelige „claspers“ (*Allman* [16]), som spiller saa stor Rolle under denne Arts Udvikling, men som aldeles ikke forekommer hos de øvrige Arter — og Resultaterne kan derfor ikke uden videre betragtes som gjældende hele Slægten.

Det Materiale, jeg har havt til min Raadighed, har ikke været egnet til histologiske Undersøgelser, og de Oplysninger jeg kan give om Arternes finere Struktur, er derfor kun spredte og meget ufuldstændige.

Hvad *Ektodermen* angaar, saa har den hos en Art, *M. mitra*, en meget eiendommelig Struktur, som jeg tidligere har omtalt (29), men uden at give nogen Afbildning af den. Ektodermen bestaar hos denne Art af to tydelig adskilte Lag, (Tab. V, Fig. 3 b), inderst et flercellet Lag, der kun farves svagt af Boraxkarmin, og udenfor dette sees et Lag af Cylinderepithelceller, der imidlertid ikke ligger parallelt med Støttelamellen, men som bugter sig ud og ind. Hydranthens Overflade dannes saaledes af en Mængde Ektodermpapiller, saa tætstillede, at man ved en Betragtning af Dyret meget vanskelig vil opdage, at dets ydre Flade ikke er ganskejevn og glat. Jeg har ikke kunnet finde den samme Struktur hos nogen af de øvrige Arter (Fig. 6 viser et Snit af *M. phrygia*); og det fortjener at bemærkes, at denne eiendommelige Struktur af Ektodermen forekommer hos en Art, der — i Modsætning til alle de øvrige Arter — fuldstændig mangler Bedækningen af Tentakler.

*Entodermen* er overalt sterkt foldet og danner en Række tætstillede, langsgaaende Kamme, af 2—3 mm.'s Høide, der rager ind i Hydranthens Hulrum.

I Tentaklerne og specielt i de Traade, hvormed nogle Arter fæster sig til Underlaget, har Støttelamellen naaet en ualmindelig Udvikling. Mod disses distale Ende tiltager den nemlig voldsomt i Tykkelse, saa at den danner en chitinos Plade mellem Tentakelens to Cellelag, der i Tykkelse overgaar Summen af disse (Tab. III, Fig. 5).

*Allmann* har (16) givet en udforlig Fremstilling af *Myriothelas* Udviklingshistorie, og han er af den Opfatning, at Generationscellerne oprindeligt skriver sig fra Entodermen.

*Korotneff* var ogsaa først af samme Mening, og han udtaler (72): „De store embryonale Celler, der findes ved Grunden af Blastostylernes Entoderm, ophober sig paa forskellige Steder, deler sig, og danner en agglomeration;

covering, or 2) in the form of tentaculate attaching filaments, springing from the rounded base of the hydranth, or 3) with a root-like point, beset with fine attaching filaments. The first two of these forms of hydorrhiza presuppose a somewhat firm sub-stratum, while the species with the pointed root and fine attaching filaments will probably be found on a soft sandy bottom.

As regards the structure and development of *Myriothela*, it appears from *Allman's* (16) and *Korotneff's* (72, 73) minute investigations that they present many peculiarities. These investigations had reference to the species *M. coxsi*, which differs in some essential points from the other species, as, for instance, in the possession of the peculiar „claspers“ (*Allman* [16]), which play so great a part in the development of this species, but which are altogether absent in the other species. Their result cannot, therefore, as a matter of course be regarded as applicable to the whole genus.

The collection that I have had at my disposal was not adapted to histological investigation, and whatever information I can give as to the more delicate structure of the species, is therefore only fragmentary and very incomplete.

The ectoderm is in one species, *M. mitra*, of a very peculiar structure, as I have previously mentioned (29), but without giving any illustration of it. It consists of two distinct layers, (Pl. V, fig. 3 b), the inner being a multicellular layer, only faintly tinged by borax-carmin, the outer, a layer of cylindrical epithelium cells. The latter, however, does not lie parallel with the structureless lamella, but bends in and out. The surface of the hydranth is thus formed of a number of ectoderm papillæ, standing so close together that on looking at the animal, its external surface appears to be quite even and smooth. I have been unable to discover a similar structure in any of the other species (fig. 6 shows a section of *M. phrygia*), and it is worthy of remark that this peculiar structure of the ectoderm occurs in a species which, unlike all the other species, is entirely destitute of tentacles.

The endoderm is wrinkled all over, forming a serried row of ridges, 2 or 3 mm. in height, projecting into the cavity of the hydranth.

In the tentacles, and still more in the filaments with which some species attach themselves to the sub-stratum, the structureless lamella has attained an unusual degree of development, increasing enormously in thickness towards their distal end, so as to form between the two cell-layers of the tentacle a chitinous lamina which exceeds in thickness that of the two cell-layers combined (Pl. III, fig. 5).

*Allman* (16) has given a full account of the development of *Myriothela*, and he is of opinion that the generative cells originate in the endoderm.

*Korotneff* also shared this opinion at first, and says (72): „The large embryonic cells found at the base of the endoderm of the blastostyles accumulate in various places, divide and form an agglomeration, which, as it

der, idet den skyver Ektodermen foran sig, danner en Forhøining paa Overfladen“. Senere (73) har han dog forladt dette Standpunkt, da han ved nye Undersøgelser har fundet de tidligste Stadier af Gonoforernes Udvikling; og af disse hans Undersøgelser fremgaar det, at Generationscellerne hos *Myriothela*, som hos *Tubularidae*, opstaar i Ektodermen, og at Gonoforerne dannes under Anlæg af en Ektodermal „Glockenkern“.

Som jeg nedenfor skal vise, bekræfter mine Resultater *Korotneff's* Opfatning, og sandsynligvis har *Allman* ikke seet de tidligste Stadier af Udviklingen.

*Allmans* og *Korotneff's* Udtalelser gjælder *M. coxsi*; men det ser ud, som om Udviklingen af Gonoforerne sker paa samme Maade hos alle *Myriothela*-Arter.

Ved Undersøgelse af fuldt udviklede Gonoforer vil man finde, at de fuldstændig ligner de pseudomedusoide Gonoforer, som ellers forekommer hos Slægten *Lampra*. Gonoforernes Væg dannes af kun to Cellelag, af hvilke det ene staar i Forbindelse med Blastostylens Ektoderm og det andet med dens Entoderm (Tab. III, Fig. 6 e). Under den Forudsætning, at Gonoforerne hos *Myriothela* i grunden er af samme Natur som de, der findes hos *Lampra*, (hvis Udvikling jeg tidligere havde studeret, og som ligesom de almindelige medusoide Gonoforer anlægges ved Dannelsen af „Glockenkern“), søgte jeg, paa Serier af Snit gennem en stor Mængde Blastostyler, efter det allerførste Anlæg til Gonoforerne. Længe fandt jeg intet, der kunde støtte denne Opfatning, overalt fandtes en Ansamling af Generationsceller liggende i Entodermen og uden nogen Sammenhæng med Ektodermen, saaledes som ogsaa *Allmans* Afbildninger illustrerer Forholdet; men ved Undersøgelserne af meget unge Blastostyler, fandt jeg tilslut flere Exempler paa, at det tidligste Anlæg af Gonoforerne sker ved Dannelsen af en „Glockenkern“, og at altsaa Generationscellerne hos *Myriothela* som hos *Tubulariderne* har sin Oprindelse i Ektodermen. Efter min Opfatning sker Dannelsen af Gonoforer paa følgende Maade:

Paa det Sted, hvor en Gonofor skal anlægges, bugter Stottelamellen og Entodermen sig noget ud, idet den samtidig aftager i Tykkelse og Fasthed. Ektodermen, som overalt paa Blastostylerne er meget tyk og kompakt, giver kun lidt efter for det fra Entodermen øvede Tryk, og paa Blastostylernes Overflade ser man endnu længe intet Spor af Forandring (Tab. III, Fig. 6 a).

Ved Toppen af Entodermforhøiningen, hvor Stottelamellen er tyndest, sker nu en Indvandring af Ektodermceller i Entodermen (Dannelsen af „Glockenkern“), men paa samme Maade som hos de pseudomedusoide Gonoforer (se ovenfor side 18) løsner disse Celler sig helt fra Forbindelsen med Ektodermen og hele Cellerhoben vandrer ind i Entodermen, hvor den findes liggende som *Allmans* „gonogenetic chamber“, og har givet Grund til den Opfatning, at disse Celler egentlig er Entodermceller (Tab. III, Fig. 6 b-d).

pushes the ectoderm before it, produces an elevation on the surface“. Subsequently (73), however, he forsakes this standpoint, having discovered, upon fresh investigations, the earliest stages in the development of the gonophores. It appears from these investigations, that the generative cells in *Myriothela*, as in *Tubularidae*, originate in the ectoderm, and that the gonophores are formed during the formation of an ectodermal „glockenkern“.

The results of my investigations, as I shall show later on, confirm *Korotneff's* view. *Allman* has probably not seen the earliest stages in the development.

The remarks of *Allman* and *Korotneff* have reference to *M. coxsi*, but it seems as if the development of the gonophores takes place in the same manner in all species of *Myriothela*.

An examination of fully-developed gonophores will show that they bear a perfect resemblance to the pseudomedusoid gonophores of the genus *Lampra*. The wall of the gonophores is formed of only two cell-layers, one of which is connected with the ectoderm, and the other with the endoderm of the blastostyle (Pl. III, fig. 6 e). Upon the supposition that the gonophores in *Myriothela* are really of the same nature as those in *Lampra*, (whose development I had previously studied, and which, like the ordinary medusoid gonophores, commence with the formation of the „glockenkern“), I sought, in series of sections through a large number of blastostyles, for this earliest rudiment of the gonophores. For a long time I could find nothing to support this view; there were always accumulations of generative cells lying in the endoderm, and quite unconnected with the ectoderm, just as *Allman's* illustrations show. But on examining very young blastostyles, I at last found several instances of the formation of the earliest rudiment of the gonophores through a „glockenkern“, and that thus the generative products in *Myriothela*, as in *Tubularidae*, originate in the ectoderm. The formation of the gonophores takes place, in my opinion, in the following manner:

At the place where a gonophore is to be formed, the structureless lamella and endoderm bulge out, at the same time decreasing in thickness and firmness. The ectoderm, which all over the blastostyles is very thick and compact, yields only slight to the pressure exerted upon it by the endoderm; and for a long time no trace of a change is discernible in the surface of the blastostyles (Pl. III, Fig. 6 a).

At the top of the endodermal elevation, where the structureless lamella is thinnest, an in-wandering of ectodermal cells takes place (formation of the „glockenkern“), but, as in the pseudomedusoid gonophores (*vide* p. 18), these cells become completely detached from the ectoderm, and the whole cell-mass wanders into the endoderm, where it is found lying as *Allman's* „gonogenetic chamber“, and has given ground to the belief that these cells are in reality endoderm cells (Pl. III, fig. b-d).



Eftersom nu dette Gonoforanlæg voxer, men ofte først naar det har naaet næsten sin fulde Udvikling, formaar det at trænge sig ud mod Overfladen af det mægtige Ektodermilag, idet det stadig skyver et Lag Ektodermceller foran sig, — det Lag, der sammen med Ektodermen senere danner Gonoforens Væg (Tab. III, Fig. 6 e).

Under Anlægget af „Glockenkern“ sees ofte et Hulrum mellem de indvandrende Ektodermceller; men da jeg aldrig har kunnet finde noget saadant paa de senere Stadier af Gonoforens Udvikling, anser jeg det ikke for sandsynligt, at dette Hulrum er af nogen blivende Betydning.

Hos *Myriothela minuta*, og ogsaa hos andre Arter, der har et begrændset Antal Gonoforer paa hver Blastostyl, anlægges vistnok foruden disse, endel flere Gonoforer, der imidlertid hæmmes i sin Udvikling. Man kan saaledes paa Snit se Combinationer af Celler og Cellelag, der fuldstændig svarer til dem, som forekommer under Gonofordannelsen, men hvor Støttelamellen mellem de forskellige Lag er fortykket og i hvilke Glockenkerncellerne ikke paa nogen Maade er omdannet.

Som jeg nævnte i min foreløbige Meddelelse, findes der foruden de nedenfor nævnte Arter af *Myriothela*, ogsaa endel Brudstykker og nogle medtagne Exemplarer, som jeg ikke finder det rimeligt at beskrive, da en saadan Beskrivelse vilde blive meget mangelfuld og bare bringe vildrede i Systematiken. Jeg har dog afbildet dem saavidt mulig noiagtig efter den Tilstand, hvori jeg har seet dem, og kanske vil det ved senere Undersøgelser blive muligt at bringe hver af dem paa sin rette Plads. Det ser ud, som om visse Dele af dem har været udsat for Indtørring, idet hele Hydranthen paa sine Steder smalner af til en fin Streng. Paa en Hydranth (Tab. III, Fig. 3) sees som en liden Knop, der udgaar fra Siden af den nær ved Munden. Dette er vistnok en abnorm Dannelse (Fig. 3 a viser et Snit gennem den), og kanske skyldes den en eller anden Parasit.

### *Myriothela phrygia*, Fabr.

(Tab. IV, Fig. 5).

**Trophosome.** Polypen cylinder- eller svagt kolleformet, 4—40 cm. hoi, fæstet ved fine Traade til Underlaget. Ingen Perisarc. Paa den nederste  $\frac{1}{5}$  sidder en hel Del Blastostyler, og hele Resten af Polypen er dækket med smaa kolleformede Tentakler. Diameteren er ved Basis stort, medens Polypens smaleste Del findes lige ovenfor Blastostylerne. Blastostylerne er forholdsvis korte, og har smaa, kolleformede Tentakler i sin distale Ende.

**Gonosome.** Pseudomedusoide Gonoforer, siddende paa Blastostylerne, over hele disses Overflade (Han), eller kun 2 diametralt modsat nær Blastostylernes distale Ende (Hun).

Som jeg nævnte i min foreløbige Meddelelse (29) er der fra Nordh.-Exp. medbragt Brudstykker af en kolosal *Myriothela*, der heldigvis blev afbildet af G. O. Sars under

As this gonophore rudiment grows, but often not until it has almost reached maturity, it succeeds in forcing its way out towards the surface of the thick ectodermal layer, always pushing before it a layer of endodermal cells, the layer which, together with the ectoderm, subsequently forms the wall of the gonophores (Tab. III, fig. 6 e).

During the formation of the „glockenkern“, a lumen is often visible between the in-wandering ectoderm cells, but as I have never been able to find anything of the kind in the later stages of the gonophore's development, I do not think it likely that this lumen is of any permanent importance.

In *Myriothela minuta*, and other species with a limited number of gonophores on each blastostyle, a few more gonophores are indeed formed, but they are checked in their development. In sections, combinations of cells and cellular layers may be seen, resembling perfectly those found during the formation of the gonophores, but with the structureless lamella between the various layers thickened, and the glockenkern cells in no way transformed.

As I stated in my preliminary communication, there are, besides the above-named species of *Myriothela*, a few fragments and some damaged specimens, which I do not consider worthy of description, as such description would be very imperfect, and calculated only to bring confusion into the systematisation. I have, however drawn them as accurately as possible in the condition in which I saw them; and it will perhaps be possible, by the aid of subsequent investigations, to give each of them its proper place. Some portions of them appear to have been subjected to shrinking, as the entire hydranth, in some instances, tapers off to a fine thread. On one hydranth (Pl. III, fig. 3), a little bud is seen, projecting from its side, near the mouth. This must be an abnormal formation (fig. 3 a shows a section through it), perhaps due to some parasite or other

### *Myriothela phrygia*, Fabr.

(Pl. IV, fig. 5).

**Trophosome.** Polyp cylindrical, or slightly clavate, from 4 to 40 cm. high, attached by fine filaments to the sub-stratum. No perisarc. On the polyp's lowest fifth are a number of blastostyles, the remainder being covered with small clavate tentacles. The diameter is greatest at the base, while the narrowest part is immediately above the blastostyles; the latter are comparatively short, and have small clavate tentacles at their distal end.

**Gonosome.** Pseudo-medusoid gonophores sessile upon the blastostyles, either covering their entire surface (male), or only 2, diametrically opposite to one another, near the distal end of the blastostyles (female).

As I mentioned in my preliminary account (29), fragments of an enormous *Myriothela* were brought back by the N. Atl. Exp., drawings having fortunately been made of it while still entire, by G. O. Sars during the expedi-



Fam. Myriothelidae.

	Hydrorhiza	Tentakler	Arter	Hydrocaulus		Hydranth		Blastostyler		Gonoforer	Findssted	
				Form	Hoide	Form	Stilling	Form	Norge		Nordh.- Exp.	Dybde
Gen. I. <b>Myriothela.</b> Ingen Hydrocaulus; Blastostylerne bæres paa Hydranthen. Pseudomedusoide Gonoforer.	Pladeformig udbreddt med chitinos Perisarc	<b>M. cocksii</b> , Vigurs. 48, 16, 72, 73, 97, 112.		Ingen Hydrocaulus		Spindelfor- mig. Største Bredde oven- for Blastos- tylerne	Ca. 40 mm.	$\frac{1}{4}$ af Hydran- thens Længde	Lange, tynde med Ten- takler spredt overalt	Spredt over Blastostyl	Aalesund; Trond- hjems- fjord	100—200 m.
	Tentakel- formede Heftegraade, der udgør fra Hydranthen Basis	<b>M. phrygia</b> , Fabr. 101, 105, 112.	Smaa kølle- formede Tentakler dækker Hydran- then ovenfor Blastosty- lerne	40—100 mm.	$\frac{1}{5}$	Rager neppe fraan over Gonoforerne. Rudimentære Tentakler i distale Ende	Over- fladen er glat	<i>Han</i> , 1—2 paa Blastostyl. <i>Han</i> , mange	Med Tuberkler af Nesle- celler	Tromsø; Trond- hjems- fjord	2195 m.	
		<b>M. verrucosa</b> , Bonnievie. 29.		Ca. 40 mm.							Hammer- fjord	?
			<b>M. gigantea</b> , n. sp. 29.		Ca. 300 mm.		Tentakler kun i distale Ende. <i>Han</i> lange, tynde. <i>Han</i> korte	<i>Han</i> , 1—2 pr. Blastostyl. <i>Han</i> , mange			St. 303	2195 m.
	Redformig tubspidset med fine Heftegraade, 10—20 mm. lang	Tentakler kun i distale Ende	<b>M. minuta</b> , Bonnievie. 29.	Smaal cylinder- formig; bøjet overst	Ca. 10 mm.		1 rudimentær Tentakel. Forsvindende ved Siden af Gonoforer	Offest kun en	Tromsø	?		
		Ingen Tentakler	<b>M. mitra</b> , n. sp. 29.	Kugleform	Ca. 50 mm.	$\frac{1}{3}$	Kugleformig med Ten- takler i distale Ende	Spredt over Blastostylerne	—	St. 10	2222 m.	

Fam. Myriothelidae.

	Hydrorhiza	Ten-tacles	Species	Hydrocaulus	Hydranth	Blastostyles		Gonophores	Where found	
					Height mm.	Position	Appearance		N. Atl. Ex.	Depth m.
Gen. I. <b>Myriothela.</b> No hydrocaulus; blastostyles upon the hydranth. Pseudo-medusoid gonophores.	Lamellary expanded with cleftinous peristome		<b>M. cocksii</b> , Vigurs. 48, 16, 72, 73, 97, 112.	No Hydrocaulus	Spindle-shape Greatest breadth above the blastostyles	1/4 of the hydranth's length	Long, thin, with tentacles scattered all over	Scattered over the blastostyles	Alesund, Tromsø Fjord	100—200
	Tentacle-like attaching filaments which grow from the base of the hydranth	Small, clavate, covering the hydranth above the blastostyles	<b>M. phrygia</b> , Fabr. 101, 105, 112.		40—400 mm.		Scarcely projects beyond the gonophores. Rudimentary tentacles at the distal end	Surface smooth	Tromsø, Tromsø Fjord	2105
			<b>M. verrucosa</b> , Bonnevie. 29.		Cylindrical or clavate. Greatest breadth at the base, smallest above the blastostyles			With tubercles of stinging cells	Hammerfest	?
			<b>M. gigantea</b> , n. sp. 29.		About 300 mm.	1/2	Tentacles only at the distal end. <i>Female</i> , long, thin; <i>male</i> , short	<i>Female</i> , 1 or 2 on each blastostyle; <i>male</i> , many		2105
	Root-like point with fine attaching filaments, 10—20 mm. long	Only at the distal end	<b>M. minuta</b> , Bonnevie. 29.		Narrow cylindrical, curved at the top		1 rudimentary tentacle. Insignificant beside the gonophores	Generally only one	Tromsø	?
		None	<b>M. mitra</b> , n. sp. 29.		Conical	1/3	Conical, with tentacles at the distal end	Scattered over the blastostyles	St. Jo	2222

(On the lower part of the hydranth)

Expeditionen, medens den endnu var hel, og denne Art skiller sig. saavidt jeg kan se, i intet Punkt fra *M. Sars's* Beskrivelse af *M. phrygia*, — kun er den langt større end denne. Dens Høide er mellem 30 og 40 cm., dens Diameter ved Basis 15—20 mm., ovenfor Blastostylerne 6—8 mm., og i den distale Ende 10—12 mm. Larverne, der er ovale af Form, har en Længde af 8—10 mm. og deres største Bredde er ca. 5 mm.

Muligens vil det ved senere Undersøgelser, — mere indgaaende end dem, jeg har kunnet anstille paa de løse Dele af Dyret, som er opbevarede — vise sig, at Nordh.-Exp. Exemplarer repræsenterer en ny Art, men foreløbig henfører jeg dem til den tidligere kjendte Art, *M. phrygia*.

**Findested.** St. 303.

### ***Myriothela gigantea*, n. sp.**

(Tab. IV, Fig. 1).

Foreløbig Beskrivelse. Bonnevie (29).

**Trophosome.** Polypen, der er ca. 30 cm. lang, er noget opsvulmet ved Basis — Diameter 7—10 mm. — og smalner jævnt af mod den distale Ende. Hydrorhiza tilspidset, med Hefetraade. Kolleformede Tentakler dækker Polypens distale Halvdel, medens Blastostyler findes spredt over den proximale. Disse er i den distale Ende forsynede med rudimentære kolleformede Tentakler.

**Gonosme.** Pseudomedusoide Gonoforer siddende paa Blastostylerne, der hos Hun-Individer er lange og tynde (10—12 mm.) med en eller to Gonoforer, medens de hos Individer af Han-Kjøn kun har en Længde af 6—7 mm. og er helt dækkede med Gonoforer.

Denne Art skiller sig fra *M. phrygia* ved sin spidse Hydrorhiza, og ogsaa derved at Blastostylerne sidder meget aabent fordelt over hele den proximale Halvdel af Polypen, medens de hos nævnte Art findes tæt sammenstillede paa den nederste  $\frac{1}{5}$ .

**Findested.** 303.

### ***Myriothela mitra*, n. sp.**

(Tab. IV, Fig. 3).

Foreløbig Beskrivelse, Bonnevie (29).

**Trophosome.** Polypen er ca. 5 cm. høj, kegleformig tilspidset — Diameter ved Basis 10 mm., ved Toppen 1—2 mm. Hydrorhiza tilspidset, 1—2 cm. lang, med Hefetraade. Ingen Tentakler. Blastostyler kegleformige, med noget bøiet Spids, der bærer en Del kolleformede Tentakler.

**Gonosome.** Pseudomedusoide Gonoforer siddende, spredt over Blastostylerne.

Denne Art er meget skarpt adskilt fra de øvrige kjendte Arter; men skjønt Hydranthen er fuldstændig nogen,

tion. As far as I can see, this species differs in no respect from that described by *M. Sars* as *M. phrygia*, except in its far greater size. Its height is between 30 and 40 cm., its diameter at the base from 15 to 20 mm., above the blastostyles from 6 to 8 mm., and at the distal end from 10 to 12 mm. The larvæ, which are oval in form, have a length of from 8 to 10 mm., and their greatest breadth is about 5 mm.

It is possible that subsequent investigations, more minute than those which I have been able to prosecute with only the fragments of the animal that have been preserved, will show that the N. Atlan. Exp. specimens represent a new species; but at present I will refer them to the previously known species, *M. phrygia*.

**Locality.** Station 303.

### ***Myriothela gigantea*, n. sp.**

(Pl. IV, fig. 1).

Preliminary description, Bonnevie (29).

**Trophosome.** The polyp, which is about 30 cm. long is somewhat swollen at the base, where the diameter is from 7 to 10 mm., and tapers gradually towards the distal end. Hydrorhiza pointed, with attaching filaments. Clavate tentacles cover the distal half of the polyp, the blastostyles being scattered over the proximal part, and furnished at their distal end with rudimentary clavate tentacles.

**Gonosome.** Pseudomedusoid Gonophores sessile upon the blastostyles, which in females are long and thin (10—20 mm.), with one or two gonophores; while in male specimens, they are only 6 or 7 mm. in length and completely covered with gonophores.

This species differs from *M. phrygia* in its pointed hydrorhiza and in the scanty distribution of the blastostyles over the whole of the proximal half of the polyp, whereas in the above-named species, they are crowded together upon the lowest fifth.

**Locality.** Station 303.

### ***Myriothela mitra*, n. sp.**

(Pl. VI, fig. 3).

Preliminary description, Bonnevie (29).

**Trophosome.** Polyp about 5 cm. high, conically pointed, diameter at the base 10 mm., at the top, from 1 to 2 mm., with attaching filaments. No tentacles. Blastostyles conical, with somewhat curving point, bearing a few clavate tentacles.

**Gonosome.** Gonophores sessile, scattered over the blastostyles.

This species is very distinctly separated from the other known species; but although the hydranth is completely naked and without a trace of tentacles, its entire



Fam. Clavidae.

	Kolonien Bygning	Arter	Kolonien		Gonoforer		Findested		
			Bygning	Høide	Stilling	Form	Norge	Nordh.- Exp.	Dybde
Gen. I.  <b>Clava.</b>  Medusoide Gonoforer, udgaar fra Hydranther, Hydrocaulus eller Hydorrhiza.	Hydranther i tætte Klynger	<b>C. squamata</b> , Müller. 57, 14.	Hydranther meget lang spindelformig; proximale Del danner Stilk, distale bærer Tentakler	10—20 mm.	Gonoforer i en Kreds næstenfor Tentaklerne; ordnet i Grupper	Ingen Radial- kanaler, ingen Tentakler	Hele Kysten	—	Litterat
	Hydranther spædt stillede	<b>C. multicornis</b> , Forsk. 57, 14.		5—7 mm.					
		Opred, uregelmæssig forgrønet Hydrocaulus	<b>C. (Corymbodonta) parasi- ticum</b> , (Cavolini, 53, 14, 122.	Perisarc nær til de proximale Tentakler	20—30 mm.	Gonoforer udgaar fra Hydrocaulus		Rog- land og Skern- sund	—
Gen. <b>Merona.</b>  Medusoide Gonoforer bæres af Blastostyler.	Opred uregnet	<b>M. (Tubulara) cornucopia</b> , Norm. 90, 57, 14.	Perisarc udviklet mod distal Ende, saa at Hydranther kan trække sig ind i den	Ca. 5 mm.	Blastostyler udgaar fra Hydorrhiza	Ingen Radial- kanaler, ingen Tentakler	?	—	?

Fam. Clavidae.

	Structure of the colony.	Species	Colony		Gonophores		Where found	
			Structure	Height	Position	Form	Norway	N. Atl. Exp. Depth
Gen. I. <b>Claava.</b>  Medusoid gonophores grow from the hydranth, hydrocaulus or hydrothiza.	Hydranths in close clusters	<b>C. squamata</b> , Müller. 57, 14.	Hydranth very long, spindle-shaped; proximal part forms a stalk, distal bears tentacles	10-20 mm.	In a circle below the tentacles; arranged in groups	No radial canals; no tentacles	Whole coast	—
	Hydranths far apart	<b>C. multicornis</b> , Forsk. 57, 14.		5-7 mm.			?	—
	Erect, irregularly ramified hydrocaulus	<b>C. (Corydontrina) parasticticum</b> , Cavolini. 33, 14, 122.	Perisarc reaches to the proximal tentacles	20-30 mm.	Spring from the hydrocaulus		Range-fjord and Skarn-sund	20-60 m.
Gen. <b>Merona.</b>  Medusoid gonophores borne by the blastostyles.	Erect, unramified	<b>M. (Tubiclava) cornucopia</b> , Norm. 90, 57, 14.	Perisarc expanded towards the distal end, so that the hydranth can hide itself in it	About 5 mm.	Blastostyles spring from the hydrothiza	No radial canals; no tentacles	?	—

uden Spor af Tentakler, tyder dog hele dens Bygning forresten paa, at den hører til samme Slægt som disse. De kegleformige Blastostyler sidder tæt sammenpakket paa den nederste  $\frac{1}{3}$  af Hydranthen og giver den et meget eendommeligt Udseende.

Findested. St. 40.

Fam. Clavidae.

*Hydranther spindelformige; Tentakler traadformige, spredt over hele Hydranthen.*

Fam. Bougainvillidae.

*Hydranther spindelformige; Tentakler traadformede, stillet i en eller flere tættstillede Kredse.*

Schneider henfører hele denne Familie til Clavidae og lader den danne Slægten *Hydractinia*. I dette Skridt kan jeg ikke følge ham, da han efter min Opfatning her benytter en anden Maalestok for Slægtsinddelingen, end ellers i systemet, og da jeg finder Grupperne inden denne Familie lige saa skarpt karakteriserede som f. Eks. de forskellige Genera inden Familien *Campanularidae*.

Koloniens Form	Gonoforerenes Stilling	Genera
Kybende Stolo, eller Rhizocaulom	Spredt over Stolo og Rhizocaulom	Perigonimus
Forgrenet Hydrocaulus	Samlede paa enkelte Hydranthers Stilke	Bougainvillia
	Paa Blastostyler, der udgaar fra stolo og Hydrocaulus	Dicoryne
		Hydractinia
Krybende Stolo; de tæthggende Tuber danner en Plade dækket af Coenosark		

structure in other respects implies that it belongs to the same genus. The conical blastostyles are crowded together upon the lowest third of the hydranth, and give it a very characteristic appearance.

Locality. Station 40.

Fam. Clavidae.

*Hydranths spindled-shaped; tentacles filiform, scattered all over the hydranth.*

Fam. Bougainvillidae.

*Hydranths spindled-shaped; tentacles filiform, closely set in one or more circles.*

Schneider refers the whole of this family to Clavidae, and allows it to form the genus *Hydractinia*. I cannot agree with him in this step, as, in my opinion, he here makes use of another standard for the generic division than the one employed elsewhere in the system, and as I consider the groups in this family to be quite as clearly characterised as, for instance, the different genera in the family *Campanularidae*.

Form of colony	Position of gonophores	Genera
Creeping stolon, or rhizocaulom	Scattered over stolon and rhizocaulom	Perigonimus
Ramified hydrocaulus	Clustered on a few hydranth stalks	Bougainvillia
	On blastostyles springing from the stolon and hydrocaulus	Dicoryne
		Hydractinia
Creeping stolon; the thickly lying tubes forming a plate covered by coenosarc		

Gen. *Perigonimus*, M. Sars.\*

Syn.: *Rhizoragium*, M. Sars.

**Trophosome.** Hydranther spindelformige med traadformige Tentakler — tilnærmelsesvis i en Kreds omkring Hydranthens tykkeste Parti — siddende eller fæstet ved en kortere eller længere Stilk til krybende Hydrorhiza eller opretstaaende Rhizocaulom.

**Gonosome.** Medusoide Gonoforer sidder i Enden af egne Stilke, der udgaar fra Hydrorhiza, Rhizocaulom eller Hydrocaulus.

Dannelsen af Rhizocaulom, der er paavist af *Schneider* hos Arter af Slægten *Lafoëa*, viser sig i sin enkleste Form og meget tydeligt hos to norske Arter af Slægten *Perigonimus*, nemlig hos *P. muscoides*, M. Sars og hos *P. sarsii*, n. sp., og en begyndende og meget illustrerende Rhizocaulomdannelse ser man af og til ogsaa hos *P. roseus*, M. Sars. Denne Art optræder næsten altid med en krybende Hydrorhiza, udbredt over Stilke af *T. indivisa* og andre Ting; men jeg har havt Anledning til at se, hvorledes flere Rør af denne krybende Stolo, hvis de paa en eller anden Maade mister sit Underlag, kan slutte sig sammen og saa at sige krybe henad hverandre. Medens det kun er undtagelsesvis, at saadanne Dannelser forekommer hos *P. roseus*, er det hos *P. muscoides* og *P. sarsii* det normale Forhold. Naar man betragter Kolonier af disse Arter, er det strax paafaldende, hvad *Schneider* ogsaa har gjort opmærksom paa for *Lafoëas* vedkommende, at Forgreningen ikke sker efter nogensomhelst Lov, Grenene udgaar ikke i noget Afhængighedsforhold til Hydranther, deres Udgangsvinkler varierer umaadelig, hos *P. sarsii* sees ingen Hydranth i Enden af Grenene, men spredt uden nogensomhelst Regelmæssighed over hele Kolonien. En saadan Mangel paa Lovmæssighed i Forgreningen eksisterer ikke hos nogen Hydroide med almindelig udviklet Hydrocaulus og jeg finder intet naturstridigt i den Tanke, at disse Kolonier er opstaaet ved at forskellige Rør af Hydrorhiza har sluttet sig sammen, paa samme Maade som vi saa det hos *P. roseus*, og saaledes har dannet et opretstaaende Rhizocaulom, i Lighed med det, som *Schneider* har paavist hos *Lafoëa*.

#### *Perigonimus repens*, Wright.

**Trophosome.** Hydrocaulus svagt forgrenet, 3—6 mm. hoi, stiger op fra en reticular krybende Hydrorhiza. Perisarc blød, rynket, udvides distalt til et Bæger, der omslutter Hydranthens nederste Del. Hydranthen har 4—12 Tentakler, der holdes vexelvis rettet op og ned.

**Gonosome.** Gonoforer næsten siddende paa Hydrocaulus, udvikler sig til fri Meduser, med 4 Radialkanaler og 4 Tentakler, af hvilke to diametralt modsatte er lenger end de to andre.

**Findested.** En ganske liden Koloni af denne Art blev funden sammen med *Plumularia rubra* paa St. 10.

Gen. *Perigonimus*, M. Sars.

Syn.: *Rhizoragium*, M. Sars.

**Trophosome.** Hydranths spindle-shaped with filiform tentacles ranged approximately in a circle round the thickest part of the hydranth, sessile or attached by a stem of varying length to the creeping hydrorhiza, or erect rhizocaulom.

**Gonosome.** Medusoid gonophores at the ends of small stems, attached to hydrorhiza, rhizocaulom or hydrocaulus.

The formation of the rhizocaulom, as pointed out by *Schneider* in species of the genus *Lafoëa*, appears in its simplest form and very distinctly, in two Norwegian species of the genus *Perigonimus*, viz. *P. muscoides*, M. Sars, and *P. sarsii*, n. sp., and the commencement of a very typical example of rhizocaulom formation is also seen now and again in *P. roseus*, M. Sars. This species appears almost always with a creeping hydrorhiza, spread over stems of *T. indivisa* and other things; but I have observed how several tubes of this creeping stolon, if in some way or other they lose their sub-stratum, may join together and, as it were, creep on one another. Whereas the occurrence of such formations is only exceptional in *P. roseus*, it is the normal condition in *P. muscoides* and *P. sarsii*. Observation of the colonies of these species immediately shows — as *Schneider*, too, has pointed out with reference to *Lafoëa* — that the ramification takes place according to no law of any kind, that the branches do not branch out in any dependent relation to the hydranths, that their branching angles are exceedingly variable, and — in *P. sarsii* — that there is no hydranth at the end of the branches, but that they are scattered entirely without regularity over the whole colony. An absence of all conformity to law in the ramification such as this does not exist in any hydroid with an ordinarily developed hydrocaulus, and I see nothing contrary to nature in the thought that these colonies have originated in the union of several hydrorhiza tubes, as we see it in *P. roseus*, and have thus formed an erect rhizocaulom, similar to that pointed out by *Schneider* in *Lafoëa*.

#### *Perigonimus repens*, Wright.

**Trophosome.** Hydrocaulus slightly ramified, from 3 to 6 mm. high, rises from a reticulate creeping hydrorhiza. Perisarc soft, wrinkled, expanding distally into a calyx surrounding the lower portion of the hydranth. The latter has from 4 to 12 tentacles, turned alternately up and down.

**Gonosome.** The gonophores are almost sessile on the hydrocaulus, and develop into free medusæ, with 4 radial canals and 4 tentacles, two of which, diametrically opposite to one another, are longer than the other two.

**Locality.** A very small colony of this species was found together with *Plumularia rubra* at Station 10.



Fam. Bougainvillidae.

	Koloniens Form	Arter	Hydrocaulus Højde	Perisarc	Hydran- thens Tentakler	Gonosome		Findssted	
						Stilling	Form	Norge	Nordh.- Exp.
Gen.  Perigonimus.  Spindelformige Hydranther med transformerede Tentakler i en Kreds. Gonoforer i Enden af egne Stilke, der udgaar fra Hydorrhiza eller Hydrocaulus	Krybende Hydorrhiza	Uegnet Hydrocaulus	P. abyssi, G. O. Sars. 97.	1-2 mm.	3-5	Paa Hydro- caulus	Fri Meduser med 1 Radialkanaler og 1 Tentakler	Stavanger Harslanger- fjord	100-600 m.
		Hydrocaulus med forgrenet næse	P. repens, Wright. 123, 57, 14.	3-6 mm.	4-12			Balsdal	St. 10 160 m.
	Opret- stående Rhizo- caulon	Hydranther med stærkt udviklede paa- staaende Rhizocaulum	P. muscoides, M. Sars. 100.	20-30 mm.	Ca. 12	Paa Rhizo- caulon eller Hydro- rhiza		Bergen Christians- sund	100-200 m.
		Hydranther i Enden af lange ugrede Stilke	P. sarsii, n. sp.				Festsiddende med mange Eg	Christians- sund	?
	Krybende Hydorrhiza		P. roseus, M. Sars. 105.	10-12 mm.	5			Bergen Lofoten	10-200 m.

\* Nye norske Hydroider. Bergens Museum Aarog 1898.

Fam. Bougainvillidae.

	Form of colony	Species	Hydrocaulus Højde	Perisarc	Hydranth tentacles	Gonosome		Where found	
						Position	Form	Norway	N. Atl. Exp.
Gen.  Perigonimus.  Spindle-shaped hydranths with filiform tentacles in a circle. Gonophores at the end of special stalks, spring- ing from the hydorrhiza or hydrocaulus	Creeping hydorrhiza	P. abyssi, G. O. Sars. 97.	1-2 mm.	Soft, wrinkled, expanded usually into a calyx surrounding the lower part of the hydranth	5-7	On the hydro- caulus	Free-swimming medusa with 1 radial canals and 4 tentacles	Stavanger to Harslanger- fjord	100-600 m.
		Hydrocaulus at little ramified	P. repens, Wright. 123, 57, 14.	3-6 mm.	1-12			Balsdal	St. 10 160 m.
	Erect rhizo- caulon	Hydranths al- most sessile on the rhizocaulum	P. muscoides, M. Sars. 100.	20-30 mm.	Ca. 12	On the rhizo- caulon, or hydro- rhiza		Bergen to Christians- sund	100-200 m.
		Hydranths at the end of long, unramified stalks	P. sarsii, n. sp.				Sessile, with numerous eggs	Christians- sund	?
	Creeping hydorrhiza		P. roseus, M. Sars. 105.	10-12 mm.	5			Bergen to Lofoten	10-200 m.

\* Nye norske Hydroider. Bergen Museum Aarbook, 1898.

Fam. Bougainvillidae.

	Perisarc	Arter	Hydrocaulus	Hydranth		Gonosome		Findsted	
				Form	Ten-takler	Stilling	Form	Norge	N. Avst. Dybde
(Gen. II. Bougainvillia. Gonoforer sidder samlet paa Hydranthstilke.	Fuld- stændig hyalin	<b>B. vanbenedeni</b> , Bonnievie, 25, 29.	Lange træng- formige Vedhæng	Lange; Tilstand næsten cylind- riske	Ca. 12 Tentakler	Mange Gonoforer paa en Stilke	Lateral	Espesvær	—
	Ryner overalt paa de mindre Grene	<b>B. ramosa</b> , Allm. 14.	Perisarc omslutter Hydran- then ind- til Basis			Gonoforer spredt over enkelte Hydran- thers Stilke			
	Næsten hyalin eller Ring-	<b>B. obscura</b> , n. sp.	Ingen træng- formige Vedhæng			1 eller næsten Gonoforer paa en Stilke			

Fam. Bougainvillidae.

	Perisarc	Species	Hydrocaulus	Hydranth		Gonosome		Where found	
				Form	Ten-tacles	Position	Form	Norway	N. Avst. Depth m.
(Gen. II. Bougainvillia. Gonophores sessile, clustered on the hydranth stalks.	Wrinkles all over the smaller branches	<b>B. vanbenedeni</b> , Bonnievie, 25, 29.	Long, filiform append- ages	Long, when extended almost cylindrical	About 12 tentacles	Many on one stalk	Lateral	Espesvær	—
	Quite hyaline	<b>B. ramosa</b> , Allm. 14.	No filiform append- ages			Scattered over a few hydranth stalks			
	Almost opaque	<b>B. obscura</b> , n. sp.	Compound, 20—50 mm. high			1 or very few on the same stalk			

Fam. Bougainvillidae.

	Hydrocaulus	Arter	Hydrocaulus	Hydranth		Gonosome		Findestæd		
				Form	Ten-takler	Blastostyles	Gonophores	Norge	N. havs. Bsp.	Dybde
Gen. III. <b>Dicoryne.</b> Blastostyles udgaar fra Hydrorhiza og Hydrocaulus	Tynd, boielig, svagt forgrenet næsten ingen Rynker	<b>D. flexuosa,</b> G. O. Sars. 97.	Enkel	Kort og tyk	Ca. 12 i en Kred	Meret korte, lige til Spid- sen besat med Gonoforer	Egformig flimmer- belagt med to træd- formede Tentakler i den ene Ende	Lofoten	—	100—200 m.
	Stiv, opret; med tydelige Ringe	<b>D. conferta,</b> Alder. 57, 14.				Lang, spin- delformig; (Gonoforer kun ved Basis og Stamine Fra Stole og Stamme)	—	Kristiania- fjorden til Lofoten	—	40—400 m.

Fam. Bougainvillidae.

	Hydrocaulus	Species	Hydrocaulus	Hydranth		Gonosome		Where found		
				Form	Ten-tacles	Blastostyles	Gonophores	Norway	N. Atl. Bsp.	Depth m.
Gen. III. <b>Dicoryne.</b> Blastostyles spring from the hydrorhiza and hydrocaulus.	Thin, flexible, slightly ramified, hardly any wrinkles	<b>D. flexuosa,</b> G. O. Sars. 97.	Simple	Short and thick	About 12 in a circle	Very short, covered with gonophores to the very point	Oviform, covered with winners.	Lofoten	—	100—200
	Stiff, erect, with distinct rings	<b>D. conferta,</b> Alder. 57, 14.				Long, spindle-sha- ped; gono- phores only at the base	With two filiform tentacles at one end	Kristiania Fjord to Lofoten	—	40—100



Fam. Bougainvillidae.

	Hoide	Blastostyler	Gonoforer	Arter	Hydro- rhiza	Hydro- caulus	Ten- takler	Gonoforer	Norge	Findested			
Gen. IV.  Hydractinia.  Kolonien krybende Hydro- rhiza dækket af et sammenhængende Lag Coenosark.	1—2 mm.	Fullstændige Hy- dranther af samme Størrelse som de øvrige	3—6 i Kreds om Blastostyl	H. humilis, Bonne- vie. 29.	Krybende. Tub. et tæt Lag af anastomoserende Tub. dækket af Coenosark.  Ikke udviklet		Ca. 20	Sessil. Ingen Radial- kanaler	Mange	20—40 m.			
				H. sarsii, Steenstr. 100, 57, 14, etc.									
	Små Hydranther med 1—8 Tentakler	5—7 mm.	H. carnea, M. Sars. 100, 57, 14, etc.	8—16 i 4 Rækker			Påtvæ- nede Meduse 1 Tentakler	Kristiana- fjorden til Nordkap	Ned til 100 m.				
			5—7 mm.										
	Ca. 10 mm.	Atrofierede Hydranther, små og med rudimentære Tentakler	2 pr. Blastostyl	H. allmanii, Bonne- vie. 29.			Ca. 20 i fuldstændige Rækker	Sessil. Med 1 Radial- kanaler	Mange	St. 137—312 m.			
				H. ornata, Bonnevie. 29.			Ca. 12	Ornament i distal Ende. Polygonale Eg		St. 250 m.			
	1—2 mm.	Fullstændig atrofierende, kun som en meget liden Stilk	3—6 i Kreds om Blastostyl	H. echinata, Flem- ming. 57, 14, etc.			Ca. 20 i 4 Rækker	Sessil. uden Radial- kanaler	Kristiana- fjorden til Nordkap	40—200 m.			
				H. minuta, Bonne- vie. 29.			Ca. 12, forholds- vis lange, 2—3 mm.		Bergens- fjorden	100 m.			

Fam. Bougainvillidae.

	Height	Blastostyles	Gonophores	Species	Hydro-rhiza	Hydro-caulis	Ten-tacles	Gonophores	Where found				
									Norway	N. Atl. Exp.	Depth, m.		
Gen. IV.  <b>Hydractinia.</b>  The creeping hydrorhiza of the colony covered by a connected layer of coenosare.	1—2 mm.	Complete hydranths of same size as the others	3—6 in a circle round the blastostyle	<b>H. humilis</b> , Bonnevie. 29.	Creeping. Forms a thick layer of anastomosing tubes, covered with coenosare.	Not developed	About 20	Sessile. No radial canals	Eggs and sperma in one gonophore	Manger	20—40		
	6—7 mm.	Small hydranths with from 4 to 8 tentacles		<b>H. sarsii</b> , Steenstr. 100, 57, 14, etc.			8—16 in two rows	4—10 eggs		Bergen, Manger	20—40		
				<b>H. carnea</b> , M. Sars. 100, 57, 14, etc.			Free-swimming medusae	4 radial canals; 4 tentacles		Kristiania Fjord to North Cape	Down to 400		
		Atrophied hydranths, small and rudimentary tentacles	2 on each blastostyle	<b>H. allmanii</b> , Bonnevie. 29.			About 20 in serrated rows	Numerous eggs		Stations 157, 312	800—1200		
	About 10 mm.		1 on each blastostyle	<b>H. ornata</b> , Bonnevie. 29.			About 12	Sessile. 1 radial canals	Ornament at the distal end; polygonal eggs	Station 270	250		
	Completely atrophied, merely like a very small stalk			3—6 in a circle round the blastostyle			<b>H. echinata</b> , Fleming. 57, 14, etc.	About 20, in two rows	Sessile. No radial canals	1—10 eggs in each gonophore	Kristiania, Fjord to North Cape	—	40—200
							<b>H. minuta</b> , Bonnevie. 29.	About 12; comparatively long 2—3 mm.		Bergen Fjord	Station 374	100	

**Perigonimus abyssi, G. O. Sars.**

**Trophosome.** Hydrorhiza reticulær, krybende; Hydrocaulus opret, ugrenet, 1—2 mm. hoi, dækket af en blod rynket Perisarc, der omslutter Hydranthens nederste Del. Disse har 5—8 Tentakler.

**Gonosome.** Gonophorer udgaar fra Hydrocaulus eller Hydrorhiza, udvikler sig sandsynligvis til fri Meduser.

**Findested.** Fundet paa *Nucula tumidula* ved Station 325.

**Gen. Hydractinia**

kommer efter sin Diagnose til at omfatte de tidligere Familier *Hydractinidae* og *Podocorynidae*, der kun adskilte sig ved Gonoforernes Udviklingsgrad.

**Hydractinia allmanii, n. sp.**

(Tab. I, Fig. 1).

Foreløbig Beskrivelse, Bonnevie (29).

**Trophosome.** Hydranther 6—7 mm. høje, med mange Tentakler (Antallet varierer) i flere tættstillede Kredse. Blastostyler smaa (ca.  $\frac{1}{2}$  mm.) med rudimentære Tentakler.

**Gonosome.** Fastsiddende Gonoforer med 4 Radialkanaler, som Regel to ligeoverfor hinanden paa hver Blastostyl, og disse to paa meget forskelligt Udviklingstrin.

Som jeg nævnte i min foreløbige Meddelelse danner denne Art, sammen med den nedenfor beskrevne *H. ornata* et Mellemlid mellem de tidligere kjendte Arter af *Hydractinia* og *Podocoryne*, idet deres Gonoforer er udstyret med Radialkanaler uden at de dog nogensinde udvikler sig til fri Meduser. Det viser sig saaledes ogsaa her, at der intet sprang er mellem de Arter, der har de simpleste fastsiddende Gonoforer og saadanne, hvis Gonoforer bliver til fri Meduser, men at man inden Slægten *Hydractinia*, ligesom indenfor saamange andre Hydroideslægter, har en hel sammenhængende Kjede af Arter, hvis Gonoforer naar de forskellige Udviklingstrin mellem de nævnte Yderpunkter.

**Findested.** St. 137, 312.

**Hydractinia ornata, n. sp.**

(Tab. I, Fig. 2).

Foreløbig Beskrivelse, Bonnevie (29).

**Trophosome.** Hydranther ca. 10 mm. lange, med ca. 12 Tentakler. Blastostyler meget smaa og med rudimentære Tentakler.

**Perigonimus abyssi, G. O. Sars.**

**Trophosome.** Hydrorhiza reticulate, creeping; hydrocaulus erect, unramified, from 1 to 2 mm. high, covered by a soft, wrinkled perisarc, which surrounds the lower part of the hydranths. These have from 5 to 8 tentacles.

**Gonosome.** The gonophores rise from the hydrocaulus or hydrorhiza, and probably develop into free medusæ.

**Locality.** Found upon *Nucula tumidula*, at Station 325.

**Gen. Hydractinia.**

This genus, according to its definition, will embrace the earlier families, *Hydractinidae* and *Podocorynidae*, which differed only in the degree of development to which the gonophores attained.

**Hydractinia allmanii, n. sp.**

(Pl. I, fig. 1).

Preliminary description, Bonnevie (29).

**Trophosome.** Hydranths 6 or 7 mm. high, with numerous tentacles (number variable) in several circles set close together. Blastostyles small (about  $\frac{1}{2}$  mm.) with rudimentary tentacles.

**Gonosome.** Fixed gonophores with 4 radial canals, two, as a rule, upon each blastostyle, opposite one another, and at very different stages of development.

As I<sup>2</sup>/<sub>3</sub> mentioned in my preliminary communication, this species, with *H. ornata*, described below, forms an intermediary link between the previously known species of *Hydractinia* and *Podocoryne*, their gonophores being furnished with radial canals, and yet never developing into free medusæ. It appears here too, that there is no gap between the species with the simplest fixed gonophores, and those whose gonophores turn into free medusæ; in the genus *Hydractinia*, as in so many other hydroid genera, there is a connected chain of species, whose gonophores attain the various stages of development between the above extremes.

**Locality.** Stations 137, 312.

**Hydractinia ornata, n. sp.**

Pl. I, fig. 2).

Preliminary description, Bonnevie (29).

**Trophosome.** Hydranths about 10 mm. long, with about 12 tentacles. Blastostyles very small, and with rudimentary tentacles.



**Gonosome.** Fastsiddende Gonoforer, 1—2 mm. lange, med 4 Radialkanaler, der udenpaa viser sig som mørkebrune Linier; disse lobe sammen mod den distale Ende i et firkantet Skjold, som i sin Midte bærer en hvid Tegning, som af et Firkloverblad. Gonoforerne sidder kun en paa hver Blastostyl, og disse, hvis Størrelse er forsvindende ligeoverfor Gonoforerne, er sterkt bøiede, saa at Gonoforerne faar en opret Stilling.

Hydranthernes Størrelse og Gonoforerne eiendommelige Udseende — dens Tegninger kan saavidt sees med blotte Øine — gjør denne Art let kjendelig. Da Blastostylerne er saa smaa og samtidig bøiede, saa at Gonoforerne Stilling blir opret, ser det ved en overfladisk Undersøgelse af Kolonien ud, som om Gonoforerne udgaar fra selve Hydrorhiza. Alle Individer i en Koloni er af samme Kjon. Jeg har kun havt Anledning til at undersøge en Koloni af Hunkjon, og her kan man allerede udvendig og med svag Forstørrelse se Æggene gennem Gonoforvæggen, som en regelmæssig Mosaik af 6-sidede Polygoner.

**Findested.** St. 270.

#### **Hydractinia minuta, n. sp.**

(Tab. I, Fig. 3).

Foreløbig Beskrivelse, Bonnevie (29).

**Trophosome.** Hydranther 1—2 mm. høje, med ca. 12 Tentakler, der'er 2—3 mm. lange. Blastostyler næsten usynlige og uden Spor af Tentakler.

**Gonosome.** Fastsiddende Gonoforer uden Radialkanaler, sidder 3—5 i en Kreds om den forsvindende Blastostyl. Ca. 6 Æg udvikles i hver Gonofor.

Denne lille Art, der nærmest ligner *H. humilis* Bonnevie, og som sammen med denne repræsenterer Slægtens mindste Arter, udmerker sig ved den fuldstændige Atrofi af de gonoforbærende Hydranther.

**Findested.** (Spitsbergen) St. 374.

#### **Fam. Eudendridae.**

*Hydranther med kolleformet Proboscis, sterkt udvidede i den proximale Del, der bærer en Kreds traadformige Tentakler.*

Paa Grund af Hydranthens Form saavel som Gonoforerne eiendommelige Udvikling har *Schneider* atter stillet Slægten *Eudendrium* i en egen Familie, efterat *Lerinsen* havde sat den ind under Fam. *Bougainvillidae*, og jeg er enig med ham i, at Slægten bør indtage en Særstilling i Systemet.

Gonoforerne er ikke Medusoide; de har en meget enkel Bygning og kunde passende beholde den af *Allman* indførte Betegnelse „simple Sporosacs“.

**Gonosome.** Fixed gonophores, 1—2 mm. long, with 4 radial canals, that appear, from the outside, as dark brown lines running together towards the distal end, and forming a square shield, in the middle of which there is a white figure like a quatrefoil. There is only one gonophore on each blastostyle, and the blastostyles, whose size is infinitesimal as compared with that of the gonophores, are very much bent, thus giving the gonophores an erect position.

The size of the hydranths, and the characteristic appearance of the gonophores (the markings on them are barely visible to the naked eye) cause this species to be easily recognisable. From the fact of the blastostyles being so small, and at the same time so bent that the position of the gonophores becomes erect, it appears, on a superficial examination, as if the gonophores arose from the hydrorhiza itself. All the persons in a colony are of the same sex. The only colony I have had the opportunity of examining was one of females; and from without, when slightly magnified, the eggs might be seen through the wall of the gonophore, like a regular mosaic of hexagons.

**Locality.** Station 270.

#### **Hydractinia minuta, n. sp.**

(Pl. I, fig. 3).

Preliminary description, Bonnevie (29).

**Trophosome.** Hydranths 1—2 mm. high, with about 12 tentacles, 2 or 3 mm. in length. Blastostyles almost invisible, and without tentacles.

**Gonosome.** Fixed gonophores without radial canals, from 3 to 5 in circle round the inconspicuous blastostyles. About 6 eggs develop in each gonophore.

This little species, which principally resembles *H. humilis* Bonnevie, and, with it, represents the smallest species of the genus, is distinguished by the complete atrophy of the gonophorebearing hydranths.

**Locality.** (Spitzbergen) Station 374.

#### **Fam. Eudendridae.**

*Hydranths with clavate proboscis, greatly expanded in the proximal part, which bears a circle of filiform tentacles.*

On account of the form of the hydranth, and the peculiar development of the gonophores, *Schneider* has again placed the genus *Eudendrium* in a family of its own, after *Lerinsen* had placed it in the family *Bougainvillidae*. I agree with him in considering that the genus occupies a peculiar position in the system.

The gonophores are not medusoid. They are of a very simple structure, and might very well retain the designation introduced by *Allmann* of „simple sporosacs“.

Fam. Eudendriidae.

	Hydrocaulus	Ringe	Hydranth	Arter	Hydrocaulus	Gonosome			Findested	
						Form	Stilling	Hun	Norge	Dybde
Gen. <b>Eudendrium.</b> [Familiens Kjen- demerker.]	Sammen- sat	Ved Grenenes Udgangs- punkt	Store, med ca. 20 Tentakler	<b>E. ramosum</b> , Lin. 57, 14.	Ca. 100 mm. høi	2 Kamre	Omkr. atrophi- erede Hydranther	Spreidt over Hydranthen og dens Stilk	Hole Kysten	10—200 m.
				<b>E. rameum</b> , Pal. 57, 14.	70—200 mm. høi		Ikke atrophi- erede Hydranther			10—200 m.
				<b>E. arbuscula</b> , Wright. 57, 14.	30—60 mm. høi	Ende i distale Kamre	Tætte Grupper paa korte Stille ledet paa Stammen	Ukjendt	Drybak, Solsvig	?
				<b>E. annulatum</b> , Norm. 90, 57, 14, 29.	Tyk og strikf. forgr. Ca. 100 mm. høi	Kamre i distale Nesle- celler		Protrageret Klaser fuldst. atrophi- erede Hydranther	Espevær, Væden	?
				<b>E. insigne</b> , Hincks. 57, 14.	10—20 mm. høi	2 Kamre	Radiært fra Fugen omkr. ikke atrophi- erede Hydranther	Spreidt over, Hydranth og dens Stilk	?	?
	Enkel	Ved Grenenes Udspring	Ca. 18 Tentakler. Løs, rykket Hinde omkring neder. Del	<b>E. vaginatum</b> , Allm. 57, 14, 29.	20—40 mm. høi	Ukjendt		Radiært om næsten atrophi- erede Hydranther	?	?
				<b>E. dispar</b> , Agass. 4, 1, 14.	Ca. 50 mm. høi	2—3 Kamre	Uregelm., lang omkr. ikke atrophi- erede Hydranther	Kugle- form i næste Kamre	Solsvig	?
				<b>E. tenellum</b> , Allm. 18 (Berg. Mus. Aarbog 1898).	Ca. 10 mm. høi	Ukjendt			Bergen Lofoten	10—200 m.
				<b>E. capillare</b> , Alder. 5, 57, 14.	10—20 mm. høi. Tynd Perisarc	2 Kamre Tuberkel (Nesle) distalt	Radiært omkr. fuldst. atro- phi- erede Hydranther; paa Stilke, der udgaar fra Hydro- caulus		Bonge- strøm— Lofoten	40—100 m.
				<b>E. planum</b> , Bonne- vie. 29.	Ca. 80 mm. høi	Ukjendt		Radiært om korte Stille paa Stammen	?	?
				<b>E. hyalinum</b> , n. sp.	Ca. 1 mm. høi	Ukjendt			Bergen	?

A n m.: Blandt andre nye Arter opstillede jeg (29) ogsaa en Art (E. stratum, hvis væsentlige Kjenndemerke var, at Chitinerne i Stammen og Gænen var forsynede med et fælles Overtræk.

Tiltrods for den intime Forbindelse, der synes at finde Sted, er jeg dog ikke sikker paa, at ikke dette Overtræk er dannet ude fra, og jeg optager derfor ikke Arten i denne Fortegnelse, men afventer nærmere Undersøgelser.

	Hydrocaulus	Rings	Hydranth	Species	Hydrocaulus	Gonosome		Where found	
						Male	Female	N. Atl.	Depth m
						Form	Position	Norway	
Gen. <b>Eudendrium.</b> [Characters of the family.]	Compound	At the place where the branches issue	Large, with about 20 tentacles	<b>E. ramosum</b> , Lin. 57, 14.	About 100 mm. high	2 chambers	Round atrophied hydranth	Scattered over hydranth and its stalk	10-200
				<b>E. rameum</b> , Pal. 57, 14.	50-200 mm. high		Non-atrophied hydranth		Whole coast
		All over the smaller branches	Many tentacles; ring of stinging cells at base	<b>E. arbuscula</b> , Wright. 57, 14.	30-60 mm. high	Stinging cells at the distal end	Thick clusters on short stalks, perpendicular to the stem	Unknown	St. Atl. to 500
			16-20 tentacles	<b>E. annulatum</b> , Norm. 90, 57, 14, 29.	Thick and much branched. 60-100 mm. high	2 chambers	Radially from the furrow round non-atrophied hydranth	Botryoidal clusters; completely atrophied hydranth	Drøbak, Solsvig
			20-25 tentacles. Furrow round the lower part	<b>E. insigne</b> , Hincks. 57, 14.	10-20 mm. high	2 chambers	Radially from the furrow round non-atrophied hydranth	Scattered over hydranth and its stalk	?
	Simple	At the place where the branches issue	About 18 tentacles. Loose, wrinkled membrane around the lower part	<b>E. vaginaium</b> , Allm. 57, 14, 29.	20-40 mm. high	Unknown	Radial round almost atrophied hydranth	Irregular oval	?
			About 25 tentacles	<b>E. dispar</b> , Agass. 4, 1, 14.	About 50 mm. high	2 or 3 chambers	Irregular ring round non-atrophied hydranths	Spherical	Solsvig
			About 20 tentacles	<b>E. tenellum</b> , Allm. 18 (Bergen Mus. Yearbook, 1898)	About 40 mm. high	Unknown	On and below the hydranth		Bergen to Lofoten
		Irregular in one plane	20-30 long tentacles	<b>E. capillare</b> , Alder. 5, 57, 14.	10-20 mm. high. Thin pericard	2 chambers. Tubercles (stinging) at distal end	Radial round completely atrophied hydranths on stalks issuing from the hydrothiza and hydrocaulus	Peas-shaped	Bouge-strom to Lofoten
			Very small hydranths. Tentacles?	<b>E. planum</b> , Bonnevie. 29.	About 80 mm. high	Unknown	Radially round short stalks at right angles to the stem		?
	Almost unramified	Generally none	18 tentacles. Hyaline structure	<b>E. hyalinum</b> , n. sp.	About 4 mm. high	Unknown	Unknown		Bergen

Remark: Among other new species, I also (39) set up one (*E. stratum*) whose most important distinguishing feature was that the chitinous tubes in the stems and branches were furnished with a common sheath.

In spite, however, of the close connection there seems to be, I am not sure that this sheath is not formed from without, and I therefore do not take up the species under this denomination, but await more detailed investigations.



**Eudendrium rameum.** Pallas.

**Trophosome.** Hydrocaulus sammensat, 7—20 cm. høj; Forgrening fuldstændig uregelmæssig. Hydranthbærende Grene er enkle, med Ringe ved Udgangspunkt og af og til ellers. Hydrantherne er store med ca. 20 Tentakler.

**Gonosome.** *Han:* Gonoforerne har som Regel 2 Kamre og udgaar radiært omkring ikke atrophierede Hydranther. *Hun:* Pæreformede, sidder spredt over og nedenfor ikke atrophierede Hydranther.

Et Exemplar af denne Art er den eneste Repræsentant for Fam. *Eudendridae*, som blev funden under Nordh.-Exp. Kolonien er af Hunkjøn, og ca. 12 cm. høj.

**Findested.** St. 315.

**Eudendrium rameum.** Pallas.

**Trophosome.** Hydrocaulus composite, from 7 to 20 cm. high; ramification quite irregular. Hydranth-bearing branches are simple, with rings at the point of issue, and occasionally elsewhere. The hydranths are large, with about 20 tentacles.

**Gonosome.** *Male*-gonophores as a rule have 2 chambers, and stand radially round non-atrophied hydranths; *female*-gonophores are pear-shaped, scattered over and below non-atrophied hydranths.

A specimen of this species is the only representative of the family *Eudendridae* that was found during the N. Atlan. Exp. The colony is of the female sex, and about 12 cm. high.

**Locality.** Station 315.

**Monobrachium parasiticum,** Mereschkowsky.

(Tab. III, Fig. 2).

84, 120.

**Trophosome.** Hydrorhiza danner et tæt Netværk af anastomoserende Tuber, dækket af chitinos Perisarc. Hydrocaulus rudimentær. Hydranth cylindrisk, 1—2 mm. høj, med 1 Tentakel, der sidder et Stykke nedenfor Munden, og hvis Længde er 3—5 mm. Nær Hydranthens distale Ende — ovenfor Tentakelens Udspring — findes en Ring af Nesleceller.

**Gonosome.** Medusoide Gonoforer udgaar fra Hydrorhiza, fæstet ved en kort Stilk. De er betydelig større end Hydranthen (2—3 mm. høje og 1—2 mm. brede i den distale Ende), har sin største Bredde øverst og smalner jævnt af mod Stilken. De har 4 Radialkanaler, langs hvis ventrale Vægge Generationsstofferne sees liggende i 4 Par Sække. Individuer af begge Kjønn forekommer i samme Koloni. Manubrium rudimentært, uden nogen Mundaabning.

Denne meget eiendommelige Hydroide, der tidligere er funden forskellige Steder i Det hvide hav og ved Novaja Semlja, fandte sunder Nordh.-Exp. ved Spitzbergen, i to Kolonier og sammen med *Hydractinia minuta*.

Arten er først beskrevet af *Mereschkowsky* (84) og senere af *Wagner* (120), der har gjort den til Gjenstand for indgaaende histologiske Undersøgelser.

Saadanne har jeg ikke havt Anledning til at foretage, men hvad Koloniens Bygning og Anordningen af Organerne

**Monobrachium parasiticum,** Mereschkowsky.

(Pl. III, fig. 2).

84, 120.

**Trophosome.** Hydrorhiza forms a thick net-work of anastomosing tubes, covered by a chitinous perisarc. Hydrocaulus rudimentary. Hydranth cylindrical, 1 to 2 mm. high, with one tentacle from 3 to 5 mm. in length, standing a little below the mouth. Near the distal end of the hydranth above the place whence the tentacle issues, there is a ring of stinging cells.

**Gonosome.** Medusoid gonophores issue from the hydrorhiza, attached by a short stalk. They are considerably larger than the hydranth (2 or 3 mm. high, and 1 or 2 mm. broad at the distal end), with their greatest breadth above, and tapering evenly towards the stem. They have 4 radial canals, along whose ventral walls the generative products are seen lying in 4 pairs of sacs. Persons of both sexes occur in the same colony. Manubrium rudimentary, without any oral aperture.

This very characteristic hydroid, which has hitherto been found in various places in the White Sea, and near Novaja Semlja, was found during the N. Atlan. Exp. near Spitzbergen in two colonies, and together with *Hydractinia minuta*.

The species was first described by *Mereschkowsky* (84), and subsequently by *Wagner* (120), who has made it the object of careful histological investigations. I have had no opportunity of making such investigations, but the conclusions to which I have come with regard to the

i de medusoide Gonoforer angaar, stemmer mine Resultater fuldstændig overens med *Wagners*. Jeg skal dog give en kort fremstilling af Gonoforerens Anatomi, og herunder paa enkelte Punkter supplere *Wagners*.

Gonoforerne, der i sin ydre Form ligner en Kegle, eller kanske heller en firkantet Pyramide, der staar fæstet med Spidsen nedad, viser i sit Indre alle en Meduses Organer, men i en saadan Form, at jeg anser det for sikkert, at Medusen aldrig løsriver sig. Man finder saaledes et fuldstændigt Kanalsystem — fire Radialkanaler og Ringkanal, — men disse Kanalers Vægge er saa sterkt fortykkede, at deres Hulrum blir forsvindende; dette gjælder især Ringkanalen, men ogsaa Radialkanalerne viser sig ofte paa Snit ikke som Kanaler, men som Fortykkelse af Gonoforerens Vægge, idet Entoderm laget paa deres subumbrale Side er saa sterkt udviklet, at det fylder Kanalen og samtidig ogsaa rager frem i Klokkehulrummet. Fig. 2 b viser et af de faa Snit, paa hvilke en Radialkanal tydelig tilkjendegiver sig som saadan. Den subumbrale Ektoderm danner langsefter Radialkanalerne en næsten cylinderformet List, der tjener som Støtte for Generationsorganerne, og fra hvilken den tynde Hinde udvikles, der omgiver disse. Hermaphroditisme forekommer ikke; men man finder Individet af begge Kjønn forenede i en og samme Koloni. Generationsstofferne ligger, som ovenfor nævnt, langs Radialkanalerne, i 8 Sække, der parvis er forbundet ved de omtalte Ektoderm lister.

Manubriet er kun rudimentært, findes som en liden Knap helt nede i Gonoforerens Stilk. Det undgik *Mereschkowskys* Opmerksomhed, medens *Wagner* har seet det og givet en Afbildning af det (Tab. IX, Fig. 14). Da denne Afbildning imidlertid ikke gir noget klart Indtryk af Manubriets Stilling og Størrelse i Forhold til Gonoforen, supplerer jeg den med en anden (Fig. 2 c), udført efter et Længdesnit, og som viser, at Manubriet kun findes som en liden Udbugtning nede i Gonoforerens smaleste Del, og at det ikke engang rager op til det Sted, som man, efter den ydre Form at dømme, vil betragte som Overgangen mellem Stilk og Gonofor.

*Monobrachium*s medusoide Gonoforer hører efter sin Bygning til *Leptomeduserne*, idet Generationsorganerne har sin Plads langs Radialkanalerne og ikke paa Manubriet; og dette anviser dem en Plads i Systemet paa Grænsen mellem de athecate og de thecate Hydroider, paa samme Tid som dens eiendommelige Bygning, baade hvad Hydranth og Gonofor angaar, holder den i Afstand fra de øvrige kjendte Familier af begge disse Grupper.

Findested. St. 374.

structure of the colonies, and the arrangement of the organs in the medusoid gonophores, agree in every particular with those of *Wagner*. I shall, however, give a short description of the gonophores, and in so doing supplement *Wagner's* description on certain points.

In external appearance, the gonophores resemble a cone, or rather a quadrilateral pyramid standing upon its apex, while internally it exhibits all the organs of a medusa, but in such a form, that I regard it as certain that the medusa never becomes detached. There is, for instance, a complete canal system — 4 radial canals and a ring-canal — but the walls of these canals are so greatly thickened, that their cavity almost disappears. This is especially the case with the ring-canal, but the radial canals often appear in section not like canals, but like a thickening of the walls of the gonophore, as the endodermal layer on their subumbral side is so greatly developed that it fills the canal and also projects into the bell-cavity. Fig. 2 b shows one of the few sections in which a radial canal distinctly appears to be what it really is. The sub-umbral ectoderm forms an almost cylindrical fillet along the radial canals, which serves as a support for the generative organs, and from which the thin membrane surrounding them is developed. Hermaphrodites do not occur, but persons of both sexes are found united in one colony. The generative organs, as already stated, lie beside the radial canals in 8 rows united in pairs by the above mentioned ectodermal fillets.

The manubrium is only rudimentary, and is visible as a small bud at the bottom of the gonophore's stem. It escaped *Mereschkowsky's* observation, whereas *Wagner* saw it, and has given an illustration of it (Pl. IX, fig. 14). As, however, this does not give a clear idea of the position and relative size of the manubrium, I supplement it with another (fig. 2 c), made from a longitudinal section, which shows that the manubrium is only like a little swelling on the narrowest part of the gonophore, and does not even reach up to the place which, from its external shape, would appear to be the transition from stem to gonophore.

From their structure, the medusoid gonophores of *Monobrachium* belong to the *Lepto-medusæ*, the generative organs being situated beside the radial canals, and not on the manubrium. This gives it its place in the system upon the boundary line between athecate and thecate hydroids, while the peculiar structure of both hydranth and gonophore separates it from the other already known families of these two groups.

Locality. Station 374.

## Tecaphora.

### Fam. Haleciidae.

*Hydranther* spindelformige med traadformige Tentakler i en Kreds. *Hydrotheker* meget smaa, skaalformige, kan ikke optage hele *Hydranthen*.

Inden denne Familie, saavel som ellers i lignende Tilfælde, lader jeg saadanne Arter, der har Nesleorganer, danne en egen Slægt, da jeg i Anlægget af disse Organer, der optræder indenfor de forskjelligste Familier, ser et Skridt mod en videre Differentiering indenfor Kolonien.

Det er meget vanskeligt at karakterisere de forskellige Arter indenfor Slægten *Halecium*, da ofte deres væsentligste Kjendemerker ligger i Gonangiernes Bygning, medens Kolonien forresten er lidet karakteristisk og ofte varierer sterkt i sin finere Bygning. Den rent ydre Habitus af Kolonien er det bedste Kjendemerke, naar ingen Gonangier er tilstede, og ved praxis lærer man snart at adskille de forskellige Arter, medens det ofte kan være vanskeligt at sige hvori forskjellen bestaar.

#### *Halecium muricatum*, Ell. & Sol.

**Trophosome.** Hydrocaulus sammensat; Forgrening uregelmæssig, ikke synderlig tæt, Grenene stive. Ringe sees af og til ved Basis af Hydrothekerne. Disse har af og til udboiet Kant, men som Regel ikke.

**Gonosome.** Gonangier meget store, fladtrykt ovale og besatte med Pigge, der staar ordnet i flere Rækker. Gonangierne findes meget tæt stillet paa Stamme og Grene.

**Findested.** St. 322, 343.

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## Tecaphora.

### Fam. Haleciidae.

*Hydranths* spindle-shaped, with filiform tentacles arranged in a circle. *Hydrothecae* very small, cup-shaped, cannot admit the entire hydranth.

In this family, as in other similar cases, I allow such species as have stinging organs to constitute a special genus, as I see in the rudiment of these organs, which make their appearance in the most varied families, a step towards a wider differentiation in the colony.

It is very difficult to characterise the various species in the genus *Halecium*, as their most important distinguishing features are frequently found in the structure of the gonangia, while in other respects, the colony is not very characteristic, and often varies considerably in its more detailed structure. The purely external habitus of the colony is the best distinguishing feature, when there are no gonangia; and one soon learns by practice to distinguish between the various species, while it is often difficult to say wherein the difference lies.

#### *Halecium muricatum*, Ell. & Sol.

**Trophosome.** Hydrocaulus compound; ramification irregular and not very abundant, branches stiff. Rings occasionally seen at the base of the hydrothecæ. The latter sometimes have an outward-curving margin, but not as a rule.

**Gonosome.** Gonangia very large, flattened oval, covered with spines arranged in several rows. The gonangia thickly cover the stem and branches.

**Locality.** Stations 322 & 343.

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Fam. Haleciidae.

	Hydrocaulus	Hydrothek	Arter	Hydrocaulus	Gonangier			Findested	
					Stilling	Han	Hun	Norge	Nordh. Exp. Dybde
Sammenlignet	Forbreining kun i et Plan		<b>H. planum</b> , n. sp. *	Intermodier jævntykkede i hele sin Længde. Længden 4 Gange Bredden. 1—3 Hydrotheker i Kreds distalt	Ved Siden af Hydrothekerne paa Intermodiernes distale Del	Ukjendt	Kun unge Stad, er kjendt. Ligner Gonangier hos H. halecinum	Bergen	— ?
		Rørformede Hydrotheker. Diameteren noget større i distale end i proximale Ende. Ingen udboiet Kant	<b>H. plumosum</b> , Hincks. 57.	Tynd, boelig Stamme; korte Intermodier, skilt ved skjævt stillede Led		Ukjendt		Bukken, Soon	— ?
	Hovedstammen findes paa uregelmæssig, de største Grene derimod regelmæssig fjærførmig formede	Ingen Ringe findes paa Grene eller Hydrotheker	<b>H. halecinum</b> , Lin. 57.	Intermodiernes Længde omtrent to Gange deres Bredder i den distale Ende			Smal, oval. Tvært afskaarne Største Bredder distalt; smalt der ved distale mod prox. Ende. ; tilspidset Rørformig Aabning mod prox. Ende i distale Ende	Hole Kysten	10—200 m.
		Sterkt udboiet Kant	<b>H. labrosum</b> , Alder. 57.	Robust bygget Koloni. Greneenes Bygning uregelmæssig; korte og lange Intermodier om hverandre	I Række paa Over- og siden af de mindre Grene		Egformig; bredest i proximal Del i distale Ende	Tj. Hjemsfjorden—Nordkap	100—300 m.
		Ringe over Greneenes Led og ved Basis af Hydrotheker	<b>H. irregulare</b> , n. sp.	Forbreining meget sterk; Stamme og Grene tykke, mørk farvede, overalt tæt besat med lyse Staaagrene		Ukjendt		— ?	?
Forbreining i alle Planer	Kun de yderste Smaa-grene afregelmæssig alternerende Skud	Hydrothekernes Form varierer. Af og til sees Kanten udboiet, men oftest er dette ikke Tilfældet	<b>H. tortile</b> , n. sp. 42	Meget kort Stamme; deler sig i flere lange tynde Grene, der kun mod Toppen bærer mindre Grene	Paa de yderste Smaa-grene	Ukjendt	Unge Stadier; Større, smalt, sterkt mod proximale Ende. Chitindekket har Tyverfiner	Balstad	— ?
	Af og til Ringe paa Hydrothekerne		<b>H. muricatum</b> , Ell. & Sol. 57.	Forbreining ikke synderlig tæt; alle Grene stive	Tæt stillet paa Stamme og Grene		Meget store, ovale; besat med Pigge, der staar ordnet i flere Rækker	Bergen—Vadsø	Station 322, 343 40—1350 m.

Gen. I.  
**Halecium**.  
Hydranther lange, spindelformige.  
Ingen Nematophorer.

\* Tabellen fortsættes paa næste Side.

Sammensat	Forretning i alle Planer					H. scutum, Clarke. 36.	Meget korte og brede Internodier; Bredden i distale Ende lig Længden; 1—2 Hydrotheker	Ved Basis af Hydrothekerne	Lange, ovale; proximale Ende smaler mod begge Enden	Store, ovale, tilspidset mod distale Ende; Aabning paa Siden af proximale Halvdel	Nordkyn, Nordkap	100—300 m.
Enkel	Fullstændig uregelmæssig Forretning	Ingen Ringe paa Grene eller Hydrotheker	Rørformige Hydrotheker; ingen udbøjet Kant	H. beanii, Johnst. 57.	H. sessile, Norm. 57.	Meget korte, kun som Aabninger i Internodierne distale Ende. Altern. stillet	Internodierne Længde 3 Gange Bredden	Paa de yderste Smågrene	Lange, smale, aftruncet i distale, tilspidset i prox. Ende	Ukjendt	Bodo, Lofoten	100—200 m.
Enkel	Ringe overalt undtagen lige under Hydrotheker	Temmelig stærkt udbøjet Kant	H. schneiderii, 107.	H. scutum, Clarke. 36.	H. sessile, Norm. 57.	Meget korte, kun som Aabninger i Internodierne distale Ende. Altern. stillet	Internodierne Længde 3 Gange Bredden	Paa de yderste Smågrene	Lange, smale, aftruncet i distale, tilspidset i prox. Ende	Ukjendt	Bodo, Lofoten	100—200 m.

Nærmere Beskrivelse og Afbildninger følger i en senere Afhandling.  
„Noue norvegische Hydroiden“, Bergens Museums Aarhøg 1898.

Fam. Haleciidae.

Gen. II.	Hydrocaulus	Hydrothek	Arter	Hydrocaulus	Hydrothek	Nematophorer	Gonangier		Findested	
							Stilling	Form	Norge	Nordh.-Exp. Dybde
Ophiodes.	Sammensat Stamme; fuldstændig uregelmæssig Forretning	Alternierende stillet. Ofte med et Par Ringe ved Basis	O. gorgonoides, G. O. Sars. 97.	Meget robust Bygning. Høide ca. 70 mm.	To Hydrotheker paa hvert Led	Spredt over Kolonien; oftest 1 under hver Hydrothek. Små aabne Chitin-knopper omfatter deres Basis	Ukjendt		Bodø	100—200 m.
	Krybende Stole. Skuld ofte smaa og uerensede	Stillet i en Række. Ingen Ringe	O. parasitica, G. O. Sars. 97.	Spæd Bygning. Høide ca. 4 mm.	1 Række 1 Hydrothek paa hvert andet Led	Ved Basis af Grenenes proximale Hydrothek	Omvendt kegelformig		Stavanger	100—200 m.

Fam. Haleciidae.

	Hydrocaulus	Hydro- thecæ	Species	Hydrocaulus	Gonangia			Where found	
					Position	Male	Female	Norway	N. Atl. Exp. Depth m.
Gen. I. <b>Halecium.</b> Hydranths long, spindle-shaped No nematophores.	Compound	Ramification in all planes	Rings above the joints of the branches, and at the base of the hydrothecæ	Only the outermost branchlets send out regularly alternating shoots	At the side of the hydrothecæ, on the distal part of the internodes	Unknown	Only early stages known. Resemble gonangia in H. halecinum	Bergen	?
					In rows on the upper side of the smaller branches	Narrow, oval. Greatest width in distal tapering towards the proximal but opening obliquely at distal end	Like male; divided at distal end	Whole coast	40—200
					On the outermost small branches	Unknown	In early stages: large, tapering rapidly proximally. Chitinous sheath furrowed transversely	Balstad	?
					Thick upon stem and branches	Very large oval; covered with spines, arranged in several rows	Stations 422, 343	Bergen to Vadso	10 1350



Compound	Branches often fan-shaped at the apex	No rings on branches or hydro-thecae	Tubular; no outward-curving margin	<b>H. scutum</b> , Clarke, 36.	Very short and wide internodes; width at distal end equals length. 1 or 2 hydrotheca	At the base of the hydro-thecae	Long, oval, tapering towards both ends	Large, oval, proximal end pointed. Short, tubular opening at side of distal half	Nordkyn, N. Cape	100-160
				<b>H. beanii</b> , Johnst. 57.						
	Rami-fication quite irregular	Rings every immediately below hydrotheca where except	Very short, only like openings at distal end of internodes. Placed alternately	<b>H. sessile</b> , Norm. 57.	Length of internodes equals about 3 times their width	On the outermost small branches	Long, narrow; distal end rounded proximal end pointed	Unknown	Bodo, Lofoten	100-200
				<b>H. schneiderii</b> . 107.						

\* A more detailed description and plates will be given in a subsequent paper.  
"Neue norwegische Hydroiden", Bergen Museum Year-book, 1898.

Fam. Haleciidae.

	Hydro-caulus	Hydro-thecae	Species	Hydro-caulus	Hydro-thecae	Nematophores	Gonangia		Where found	
							Position	Form	Norway	Depth m.
Gen. II. <b>Ophiodes.</b> Hydranths clavate. Nematophores.	Compound stem; ramification quite irregular	Placed alternately. Often a couple of rings at base	<b>O. gorgonoides</b> , G. O. Sars. 97.	Of very strong build. Height about 70 mm.	Two on each joint	Scattered over the colony; generally one below each hydrotheca. Small open clefts in their base	Unknown.		Bodo	100-200
	Creeping stolon. Shoots generally small and unramified	Placed in a row. No rings	<b>O. parasitica</b> , G. O. Sars. 97.	Of slight build. Height about 4 mm.	Generally one on every other joint	Small open clefts in their base	At the base of the proximal hydrotheca	Obliterated	Stavanger	100-200



**Halecium beanii**, Johnst.

**Trophosome.** Hydrocaulus sammensat, af fin Bygning. Forgrening ikke meget sterk og fuldstændig uregelmæssig. Ingen Ringe paa Grene eller Hydrotheker. Disse er rørformige uden udboiet kant.

**Gonosome.** Gonangier sidder ved Basis af Hydrothekerne. *Han:* Lange, spindelformige. *Hun:* Store, ovale, tilspidsede mod proximale Ende, har en kort rørformig Aabning (med, Hydranthpar) paa Siden af distale Halvdel.

**Findested.** Et enkelt lidet Exemplar (*Han*) af denne Art blev funden paa Station 10.

**Halecium irregulare**, n. sp.

(Tab. V, Fig. 1).

**Trophosome.** Hydrocaulus sammensat, sterkt og uregelmæssig forgrenet. Stamme og større Grene meget tykke, mørkfarvede og tæt besatte med smaa, lyse hydrothekbærende Grene. Ringe kan forekomme over Grenenes Led og ved Basis af Hydrothekerne. Disse er alternerende stillet ved Leddenes distale Ender og i Planer, der danner ca. 90° med hverandre; deres Form varierer, — snart er Kanten udboiet, men som Regel er dette ikke Tilfældet. Hydranth med ca. 24 Tentakler.

**Gonosome.** Ukjendt.

Denne Art minder ved sin tykke Stamme og sin umaadelig tætte Forgrening om *Eudendrium annulatum* Norman, men overgaar denne i Størrelse. Dens Hydrotheker viser en Tendens til uniserial Anordning, idet deres Planer danner en Vinkel med hinanden kun paa 90°. Hvad der ellers især udmerker Arten er den uregelmæssige Bygning, baade hvad Forgreningen angaar og især med Hensyn til de hydrothekbærende Grenes Bygning. Disse kan paa sine Steder findes aldeles uden Ringe, andre Steder sees en eller to over hvert Led, medens Hydrothekerne er fuldstændig glatte, atter andre Steder har ogsaa disse Ringe ved sin Basis o. s. v.

Kolonien fandtes tæt bevokset med *Campanularia volubilis*.

**Findested.** Ukjendt.

**Fam. Campanularidae.**

*Hydranther* spindelformige, med traadformige Tentakler i en Række. *Hydrotheker* rør- til bægerformige, med eller uden Laag, kan optage hele *Hydranthen*.

*Levinsen* og *Schneider* har begge revideret denne Families Systematik; men da de gaar ud fra forskellige Synspunkter, er deres Resultater ogsaa hoist forskellige.

*Levinsen* opstiller to Familier, *Campanularidae*, for Arter, der har aabne Hydrotheker og *Campanulinidae* for

**Halecium beanii**, Johnst.

**Trophosome.** Hydrocaulus compound, of delicate structure. Ramification slight and quite irregular. No rings on the branches or hydrothecae. The latter are tubular, with no outward-curving edge.

**Gonosome.** The gonangia are situated at the base of the hydrothecae. *Male* — long, spindle-shaped; *female* — large, oval, pointed at the proximal end, having a short tubular opening (with a pair of hydranths) on the side of the distal half.

**Locality.** A single little specimen (male) of this species was found at Station 10.

**Halecium irregulare**, n. sp.

(Pl. V, fig. 1).

**Trophosome.** Hydrocaulus compound, greatly and irregularly ramified. Stem and larger branches very thick, of a dark colour, and thickly covered with light-coloured branchlets bearing hydrothecae. The latter are placed alternately at the distal end of the joints, and in planes forming an angle of about 90° with one another. Their form varies, the edge sometimes curving outwards, but not as a rule. Hydranth with about 24 tentacles.

**Gonosome.** Unknown.

This species, on account of its thick stem and extremely abundant ramification, recalls *Eudendrium annulatum* Norman, but exceeds it in size. Its hydrothecae exhibit a tendency to uniserial arrangement, their planes forming an angle of only 90° with one another. What especially distinguishes the species in other respects is its irregular structure as regards ramification, and more particularly as regards the hydrotheca-bearing branches. These, in some places, are entirely without rings; in others, with one or two rings above each joint, while the hydrothecae are quite smooth. In others again, the hydrotheca have also rings at their base, etc.

The colony was found thickly overgrown with *Campanularia volubilis*.

**Locality.** Unknown.

**Fam. Campanularidae.**

*Hydranths* spindle-shaped with filiform tentacles in a row. *Hydrotheca* tubular- to cup-shaped, with or without lid; can enclose the whole hydranth.

*Levinsen* and *Schneider* have both revised the systematisation of the family; but as they take different starting-points, the results they arrive at are very different.

*Levinsen* establishes two families *Campanularidae*, for species with open hydrothecae, and *Campanulinidae*, for

saadanne, hvis Hydrotheker kan lukkes med Laag. *Campanularidae* kommer saaledes til at omfatte de tidligere Slægter *Campanularia*, *Lafoëa*, *Filillum* o. s. v., medens *Campanulina*, *Calycella*, og andre Former med Laag maa henregnes til *Campanulinidae*. *Levinsen* har gjort noiagtige og meget værdifulde Undersøgelser over Laagets Bygning hos de forskellige Arter, og har herpaa grundet et System af ikke mindre end 7 Slægter indenfor denne Familie. Efter min Opfatning har han herved tillagt Laagets Beskaffenhed en altfor stor Betydning som systematisk Kjendemerke. Der findes — hvad *Schneider* ogsaa senere har paavist — saa mange Overgange mellem Arter med Laag og Arter, hvis Hydrotheker intet Laag har, saa der er ingen Grund til at danne to forskellige Familier for disse. Men paa samme Tid vil dog hvikesomhelst Arter af *Levinsens* 7 *Campanulinide*-slægter vise sig som indbyrdes nærbeslægtede, hvis de stilles ved Siden af en *Campanularia*- eller *Lafoëa*-Art, og jeg finder det derfor — i Modsætning til *Schneiders* Udtalelser — rimeligt at sætte saadanne Arter, hvis Hydrotheker lukkes ved et Laag, i en Slægt *Campanulina*, ved Siden af *Lafoëa* og *Campanularia*, medens derimod Laagets Beskaffenhed kun har Betydning som Arts- og ikke som Slægtskarakter.

*Schneider* opstiller indenfor Familien *Campanularidae* to Underfamilier: *Campanularinae* og *Lafoëinae*, idet han finder Spranget mellem *Lafoëa* og *Campanularia* forholdsvis saa meget større end det er mellem *Campanularia* og *Campanulina*, at han ikke kan lade dem staa som tre sideordnede Grupper. Jeg har imidlertid fundet Former, der fuldstændig formidler Overgangen mellem *Lafoëa* og *Campanularia*, baade hvad Hydrothekernes Form angaar (*L. symmetrica*, *pinnata* og *gigantea*) og med Hensyn til Gonangiernes Bygning (*L. pinnata*), og skjønt Slægten *Lafoëa* omfatter meget eiendommelige Former, saa staar den dog i den noiagtigste Sammenhæng med *Campanularia*.

Under Begrænsningen af Slægten *Campanulina*, omtaler *Schneider*, at der her, i Modsætning til, hvad Tilfældet er hos *Campanularia*, kun udvikles 1 Gonofor i hvert Gonangium, og han ser heri et væsentligt Kjendemerke for Slægten. Hos *C. pedicellaris*, der i sin Bygning forøvrigt staar meget nær de andre *Campanulina*-Arter, har jeg seet to Gonoforer i hvert Gonangium, og forøvrigt finder jeg ikke nogen systematisk Betydning i denne Anordning.

### Gen. *Lafoëa*.

Hydrotheker rør- til klokkeformige, udgaar fra en krybende Stolo eller fra Rhizocaulom (i faa Tilfælde findes en forgrenet Hydrocaulus). Gonangier stillet i tætte Klynger (Coppinia og Scapus), der er uregelmæssig spredt over Kolonien.

*Lafoëa* er en i mange Henseender eiendommelig Slægt, der dog ved Overgangsformer slutter sig til de øvrige *Campanularidae*.

species having hydrothecæ with a lid. *Campanularidae* is thus made to include the earlier genera *Campanularia*, *Lafoëa*, *Filillum*, etc., while *Campanulina*, *Calycella*, and other forms with lids must be classed under *Campanulinidae*. *Levinsen* has made careful and very valuable investigations of the structure of the lid in the various species, and has founded there upon a system of not less than 7 genera within this family. He has in so doing, in my opinion, attributed far too great an importance to the nature of the lid as a systematic distinguishing feature. As *Schneider* too has subsequently shown, there are so many transitions between species with lids, and species without, that there is no reason for making two different families for them. But at the same time, any two species of *Levinsen's* 7 genera of the fam. of *Campanulinidae* will prove to be nearly allied, if they are placed beside a *Campanularia* or *Lafoëa* species; and unlike *Schneider*, I therefore consider it right to place those species whose hydrothecæ close with a lid, in a genus *Campanulina*, in addition to *Campanularia* and *Lafoëa*, whereas on the other hand, the nature of the lid has importance only as a specific, not a generic character.

*Schneider* establishes two sub-families under the family *Campanularidae*, viz. *Campanularinae* and *Lafoëinae*, as he finds the break between *Lafoëa* and *Campanularia* comparatively so much greater than that between *Campanularia* and *Campanulina*, that he cannot let them stand as three co-lateral groups. I have found forms, however which completely bridge the gulf between *Lafoëa* and *Campanularia*, both as regards the form of the hydrotheca (*L. symmetrica*, *pinnata* and *gigantea*), and the structure of the gonangia (*L. pinnata*); and although the genus *Lafoëa* includes some very characteristic forms, it stands in the closest connection with *Campanularia*.

While defining the genus *Campanulina*, *Schneider* mentions that, unlike *Campanularia*, only 1 gonophore is developed in each gonangium, and he sees in this fact an important distinguishing feature of the genus. In *C. pedicellaris*, which is very nearly allied to the other species of *Campanulina* by the rest of its structure, I have seen 2 gonophores in each gonangium. I can see, however, no systematic importance in this arrangement.

### Gen. *Lafoëa*.

Hydrothecæ tubular to campanulate, issue from a creeping stolon, or from the rhizocaulom (in a few instances there is a ramified hydrocaulus). Gonangia are placed in thick clusters (Coppinia and Scapus) scattered irregularly over the colony.

*Lafoëa* is in many respects a peculiar genus which, however, is united to the rest of the *Campanularidae* by transition-forms.



*Schneider* har paavist, at Stammen hos de fleste *Lafoëa*-arter er en Rhizocaulomdannelse\* og ingen egentlig Hydrocaulus, skjønt den ofte skuffende kan ligne en saadan. Han støtter sin Opfatning paa Forgreningen, der aldrig hos disse Arter sees at staa i noget Afhængighedsforhold til Hydrothekerne, og Grenene kan saaledes ikke dannes ved Knopskydning fra Hydrotheker, men de er tilfældige Dannelser, fremkomne ved at en Del Stoloner løser sig fra de øvrige, og tager en anden Retning.

En saadan Rhizocaulomdannelse forekommer med faa Undtagelser (af norske Arter kun *L. pinnata*, G. O. Sars) hos alle Arter af Slægten *Lafoëa*, medens den udenfor denne Slægt hidtil kun er bemærket hos et Par Arter af *Campanularia* (norske kun *C. verticillata*) og hos Slægten *Perigonimus*, og den maa saaledes betragtes som karakteristisk for Slægten, om den end ikke kan anvendes som systematisk Kjendemerke paa den.

Hvad Hydrothekerne angaar, saa findes inden denne Slægt alle Overgange fra Rør- til Klokkeform, og man kan heller ikke paa denne Basis sætte noget skarpt skille mellem Slægterne *Lafoëa* og *Campanularia*. Men hos alle de hidtil kjendte *Lafoëa*-arter har Hydrothekerne glat Rand og meget ofte sees de, ligesom hos Fam. *Haleciidae*, at være sammensatte som af 2 eller flere Bægre, der er stukket det ene i det andet. Afstanden mellem disse forskjellige Bægres Rand er meget liden i Forhold til Hydrothekernes Længde, — og ofte synes disse blot at have en dobbelt eller flerdobbelt kontureret Rand.

En Eiendommelighed, som ligesom Rhizocaulomet synes at være karakteristisk for denne Slægt, er det, at Gonangierne stadig findes samlede i tætte Grupper; kun hos enkelte Arter voxer de spredt over Kolonien. Man har tidligere taget Feil af disse Gonangiesamlinger, og anseet dem for en egen Slægt af Hydroider: *Coppinia* Hassal, indtil *Levinsen* i 1893 offentliggjorde sin merkelige Opdagelse, at denne Slægt i Virkeligheden repræsenterer forskellige *Lafoëa*-arters Gonosome, ligesom at Slægten *Scapus* Norman (98), repræsenterer Gonosomerne hos andre Arter af samme Slægt. Under begge disse Former, *Coppinia* og *Scapus*, voxer Gonangierne paa Rhizocaulomets overfladiske Rør, der i *Coppinia* løser sig fra Stammen og under sterk vext og Forgrening lægger sig helt omkring denne, — ja de kan ofte brede sig udover flere Grene og omvoxe dem fuldstændig.

I *Scapus* er Gonangierne tætstillede, men dog fuldstændig adskilte fra hinanden, medens de i *Coppinia* staa saa tæt paa hinanden, at de ved Trykket er blevet polygonale, og sees ved Siden af hinanden som Cellerne i en Voxkage. Ved denne Form sees ogsaa stadig en Del lange Hydrotheklignende Tuber, der strækker sig radiært ud fra den oftest ovalt formede Gonangiehob, og som udenfor denne som Regel bugter sig sterkt, og saaledes danner et beskyttende Lag, indenfor hvilket de af Gonangierne udtrædende Larver gennemgaar sin videre Udvikling.

*Schneider* has shown that the stem in most *Lafoëa* species is a rhizocaulom formation\*, and no true hydrocaulus, although it often bears a striking resemblance to one. *Schneider* bases his view on the ramification, which, in these species, is never found in any condition of dependence on the hydrothecæ. Thus the branches cannot be formed by gemmation from the hydrothecæ, but are chance formations, produced by the separation of some stolons from the others, and their starting in a new direction.

A rhizocaulom formation of this kind is found, with a few exceptions (among Norw. species only *L. pinnata*, G. O. Sars), in all the species of the genus *Lafoëa*, while elsewhere it has hitherto only been observed in two or three species of *Campanularia* (Norw. only *C. verticillata*), and in the genus *Perigonimus*. It must thus be regarded as characteristic of the genus, even if it cannot be employed as one of its systematic distinguishing features.

As regards the hydrothecæ, there are found in this genus all the transitions from tubular to bell-shaped; and no clear dividing line between the genera *Lafoëa* and *Campanularia* can be based upon this foundation. But in all the hitherto known species of *Lafoëa* the hydrothecæ have a smooth margin, and are very often seen, as in the *Haleciidae*, to be compound, or as if composed of 2 or more calyces, placed one within another. The distance between the margins of these various calyces is very small in proportion to the length of the hydrothecæ; and the latter frequently appears to have only a double or multiple margin.

One peculiarity, which seems, like the rhizocaulom, to be characteristic of the genus, is that the gonangia are always found clustered in close groups. In only a few species do they grow scattered over the colony. Formerly these clusters of Gonangia were mistaken for a special genus of hydroids: *Coppinia* Hassal, until *Levinsen*, in 1893, published his remarkable discovery that in reality this genus represents the gonosome of various species of *Lafoëa*, and that the genus *Scapus* Norman (98), represents the gonosomes of other species of the same genus. In both these forms, *Coppinia* and *Scapus*, the gonangia grow upon the superficial tubes of the rhizocaulom, which, in *Coppinia*, become detached from the stem, and during their rapid growth and ramification, completely envelope it.

The gonangia in *Scapus* are placed very close together, but yet completely separated from one another, while in *Coppinia* they stand so close to one another, that they have become polygonal under the pressure, and stand beside one another like cells in a piece of honeycomb. In this form there may also often be seen a number of long, hydrotheca-like tubes, extending radially from the generally oval cluster of gonangia; and beyond it, as a rule, curving considerably, and thus forming a protecting layer, within which the larvæ issuing from the gonangia, go through their subsequent development.

\* Se under Slægten *Perigonimus*, Side 41.

\* See under genus *Perigonimus*, p. 41.

Fam. Campanularidae.

	Kolonien Form	Hydrotheker	Arter		Vinkel mellem Hydrothek og Stamme	Gonosome	Findested		
							Norge	Nordh.-Exp. Dybde	
Gen. I.  L a f o e a.  Hydrotheker rør- til klokkeformige. Oftest krybende Stole eller Rhizocaulom.  Gonangier danner Coppinia eller Scapus	Krybende Hydrothek rhizom	Rørformig; svagt udbojet Kant. Stilk med 3—4 Vindinger	<b>L. pygmaea</b> , Alder, 57.	Forekommer kun voksende på andre Hydrotheker	90°	Ukjendt	Bergen	—   ?	
		Kun boet. Den proximale Del ligger ned til Hydrothek; distale staa lodret paa denne	<b>L. serpens</b> , Hassal, 57, 38.		Proximale Del 60° distale Del 90°	Tubor tynde, bløde, uregelmæssig bojet; ligger tæt ned til Gonangierne	Mange Stationer	20—600 m.	
	Uregelmæssig Rhizocaulom	Ingen Indsnoring mellem Rhizocaulom og Hydrotheker	<b>L. abietina</b> , M. Sars, 101, 104, 111, 5, 57.	Ingen Del af Rhizocaulomet indløber i den Kolonien's Stamme.	Ca. 90°	Tuborne damper et Netværk mellem Gonangierne	St. 192, 200, 222	10—120 m.	
		Rørformig, bojede Hydrotheker, konvekse Side op. Stilkene danner to løse Vindinger	<b>L. gracillima</b> , Alder, 5, 104, 82, 36, 19.		30°—45°	Mødet lange Rør, der fløste bojet nær den distale Ende. Længde 2 mm. (Clarke)	Hele Kysten	40—750 m.	
Gen. II.  L a f o e a.  Hydrotheker rør- til klokkeformige. Oftest krybende Stole eller Rhizocaulom.  Gonangier danner Coppinia eller Scapus	Uregelmæssig Rhizocaulom	Rørformig; ikke bojet, bojet indløbet med distale Ende. Ingen Stilk. Over 2. og Rhizocaulom	<b>L. dumosa</b> , Flem, 57, 104.		15°—90°	Tuborne stærkt bojede i Røttene med Kolonien's distale Ende. Danner et Netværk.		20—250 m.	
		Hydrotheker ene skævt udviklede, konvekset størst opad. Stilk med 1—4 Spiralkredninger	<b>L. fruticosa</b> , M. Sars, 101, 104, 57, 61, 62, 116.	Rhizocaulomets forskellige Dele har ulige udvikling; saa at man skjæler en Hovedstamme og større og mindre Grene	15°—60°	Tubor meget tynde, og bojet i Spiral som en Urfør	Bergen Nordkap	10—100 m.	
	Uregelmæssig Rhizocaulom	Symmetrisk, bagerformig Hydrothek, 6—8 tydelige ulskåle Ringe paa Stilkene	<b>L. symmetrica</b> , n. sp.		60°—60°	Meget tykke Rør; stærkt med Indbøjning uregelmæssig bojede		St. 373	37 m.
		Hydrothek 6—8 mm. lang, fladtrykt distal udbojet Kant. Stilkene sammensat af ulige lange Led	<b>L. gigantea</b> , n. sp.		Uregelmæssig	Gonangier ægformule, rortubus Aabning i spredt over hele Kolonien	Molken	St. 161	800 m.
Gen. III.  L a f o e a.  Hydrotheker rør- til klokkeformige. Oftest krybende Stole eller Rhizocaulom.  Gonangier danner Coppinia eller Scapus	Uregelmæssig Rhizocaulom	Symmetrisk bagerformig Hydrothek. Halv Spiralkredning af Stilkene	<b>L. pinnata</b> , G. O. Sars, 97.	Almindelig Hydrocaulus. Overgangsform til Campanularia	Ca. 30°	Hydrothek bojet i distale Ende tre Udmundingsrør, der danner 120° med hinanden	Harangerfloden	St. 100—1100 200, 270 m.	

Fam. Campanularidae.

	Form of Colony	Hydrothecae	Species	Angle between hydrotheca and stem	Gonosome	Where found	
						Norway	N. Atl. Exp. Depth m.
Gen. I. <b>Lafocæa.</b>  Hydrothecae tubular to bell-shaped. Generally creeping stolon or rhizocaulom. Gonangia form Coppinia or Scapus.	Creeping hydro-rhiza	Tubular; slightly outward-curving margin. Stalk with 3 or 4 turns	<b>L. pygmæa</b> , Alder. 57.	90°	Unknown	Bergen	—   —   ?
		Gonicate. Proximal lies close to hydrothiza; distal at right angles to it	<b>L. serpens</b> , Hassal. 57, 38.	Proximal part 0°; distal part 90°	Tubes thin, soft irregularly curved, lie close to the gonangia	Many stations	20-100
	Irregular structure. Erect rhizocaulom	No constriction between rhizocaulom and hydrothecae	<b>L. abietina</b> , M. Sars. 101, 104, 111, 5, 57.	Circ. 60°	Tubes form a network outside the gonangia	Whole coast	Stations 192, 200, 222 40-1200
		Tubular, bent, convex side uppermost. Stalk makes two loose twists	<b>L. gracillima</b> , Alder. 5, 104, 82, 36, 19.	3-4°	Very long tubes, most of them bent near distal end. Longest 2 mm. (Clarke)	Stations 18, 48	40-750
		Tubular, not bent, somewhat expanded towards distal end. No stalk, only a constriction	<b>L. dumosa</b> , Flen. 57, 104.	15-60°	Tubes much bent in the direction of the distal end of the colony. Forms no network		20-200
		Obliquely developed, greatest convexity upwards. Stalk with 3 or 4 spiral twists	<b>L. fruticosa</b> , M. Sars. 101, 104, 57, 97, 61, 62, 116.	15°-60°	Tubes very thin, and curved in a spiral, like a watch-spring	Bergen to N. Cape	Stations 267, 322, 363 40-500
		Symmetrical, cup-shaped, 6-8 rings on the stalks	<b>L. symmetrica</b> , n. sp.	10°-90°	Very thick tubes, but quite irregularly	—	Station 313 373
		6-8 mm. long, compressed distally, outward curved margin. Stalk composed of unequal joints	<b>L. gigantea</b> , n. sp.	Irregular	Gonangia ovoid, with tubular opening; all over the colony	Moldeen	Station 164 800
	Regular pinnate hydrocaulus	Symmetrical, cup-shaped. Half spiral twist of stalk	<b>L. pinnata</b> , G. O. Sars. 97.	Circ. 30°	Every gonangium has at its distal end 3 month tubes forming angles of 120° with one another	Har-danger fjord	Stations 240, 270 100-1100
					Ordinary hydrocaulus. Transitional form to Campanularia		



*Levinsen* har iagttaget Gonosomerne (*Coppinia*) hos *L. dumosa*, *abietina*, *fruticosa* og *serpens*; og han udtaler, at de overalt har samme Bygning, kun deres Størrelse varierer hos de forskellige Arter.

Jeg har undersøgt dem hos *L. abietina*, *dumosa*, *fruticosa*, *symmetrica* og *serpens*, og jeg har i Modsætning til *Levinsen* fundet meget karakteristiske Forskelligheder hos de forskellige Arters *Coppinia*. Det er specielt Tubernes Optræden, som er eiendommelig, idet disse, f. ex., hos *L. symmetrica* er meget tykke og uregelmæssig bugtede, medens de hos *L. fruticosa* er tynde og bøiede i Spiral som en Urfjær, o. s. v. Det ser saaledes ud som om Gonosomerne hos de forskellige *Lafoëa*-Arter er ligesaa karakteristiske for Arten, som det almindelig er Tilfældet inden de øvrige Hydroideslægter, og Kjendskabet til Arternes *Coppinia* vil da sandsynligvis i Fremtiden lette Afgjørelsen af Tvilsspørgsmaal inden Systematiken.

Da jeg nedenfor i Diagnoserne benytter navnene *Coppinia* og *Scapus* for i Korthed at karakterisere de forskellige Arters Gonosome, anser jeg det for hensigtsmæssigt her skarpere at betone, hvad jeg forstaar ved hver af disse Benævnelser.

**Coppinia:** En oval eller uregelmæssig formet Samling af polygonale Gonangier, der staar tæt ind til hinanden og udgaar fra Rhizocaulomets perifere Rør, der løser sig fra Underlaget og omslutter en eller flere Grene af Moderkolonien, og fra hvilke Rør ogsaa udgaar hydrotheklignende Tuber, der skyder frem mellem Gonangierne.

**Scapus:** En Samling af Gonangier, der er tæt sammenstillede, dog uden at øve Tryk paa hinanden, og som paa enkelte Steder af Kolonien udgaar fra perifere Rør, der ikke løser sig fra Underlaget.

Overgangsformer mellem *Coppinia* og *Scapus* er af *Allman* fundet paa *L. (Cryptolaria) conferta*, og af *Clarke* paa *L. (Cryptolaria) longithecæ*. Gonangierne er hos disse Arter polygonale i sin nederste Del, men adskilte og afrundede i Toppen, og her findes ingen *Coppinia*-tuber.

#### **Lafoëa serpens, Hassal.**

(Tab. V, Fig. 5).

**Trophosome.** Hydrorhiza krybende paa andre Hydroider. Hydrotheker knæbøiede, idet den proximale Del ligger ind til Hydrorhiza, medens den distale danner en Vinkel paa 90° med denne. Svagt udboiet Kant.

**Gonosome.** *Coppinia* med tynde, bløde Tuber, der ligger tæt ind til Gonangierne; uregelmæssig bøiet.

Denne Art findes krybende paa Kolonier af andre Arter fra mange forskellige Stationer, og synes at have en meget almindelig Udbredelse.

*Levinsen* has observed the gonosomes (*Coppinia*) of *L. dumosa*, *abietina*, *fruticosa* and *serpens*; but he states that their structure is always the same, the size alone varying in the different species.

I have examined them in *L. abietina*, *dumosa*, *fruticosa*, *symmetrica* and *serpens*, and, unlike *Levinsen*, have found very characteristic differences in the *Coppinia* of different species. The appearance of the tubes is especially characteristic. In *L. symmetrica*, for instance, they are very thick and irregularly curved, while in *L. fruticosa* they are thin and spirally curved like a watch-spring, etc. It would thus appear that the gonosomes in the various *Lafoëa* species are as characteristic of the species as is generally the case in other hydroid genera, and an acquaintance with the *coppinia* of the species will probably in the future facilitate the decision of doubtful systematic questions.

As I employ the names *Coppinia* and *Scapus*, in the definitions below, for the brief characterisation of the gonosomes of the various species, I deem it advisable to emphasise more clearly the interpretation that I put upon these terms.

**Coppinia** = an oval or irregularly formed cluster of polygonal gonangia, standing close to one another, and issuing from peripheral tubes of the rhizocaulom, which become detached from the substratum, surrounding one or several branches of the parent colony, and whence also issue hydrotheca-like tubes, protruding from among the gonangia.

**Scapus** = a thick cluster of gonangia, which do not, however, exert any pressure upon one another, and which, at certain spots in the colony, issue from peripheral tubes which do not become detached from the sub-stratum.

Transition-forms between *Coppinia* and *Scapus* have been found by *Allman* in *L. (Cryptolaria) conferta*, and by *Clarke* in *L. (Cryptolaria) longithecæ*. The lower portion of the gonangia in these species is polygonal, but the top is separate and rounded, and there are no *Coppinia* tubes.

#### **Lafoëa serpens, Hassal.**

(Pl. V, fig. 5).

**Trophosome.** Hydrorhiza creeping upon other hydroids. Hydrothecæ geniculate, the proximal part lying close up to the hydrorhiza, while the distal part forms an angle of 90° with it. Slightly outward-curving edge.

**Gonosome.** *Coppinia*, with thin, soft tubes, lying close to the gonangia; irregularly curved.

This species is found creeping on colonies of other species from many different stations, and seems to have a general distribution.

**Lafoëa abietina, M. Sars.**

(Tab. V, Fig. 6).

**Trophosome.** Rhizocaulom sammensat, opretstaaende, meget forgrenet, uden at nogen Del særlig udmerker sig som Stamme. Hydrotheker rørformige, med udboiet Kant, danner en Vinkel paa ca.  $90^{\circ}$  med Rhizocaulomet, fra hvilket de ikke skilles ved nogen Indsnoring.

**Gonosome.** Coppinia, oftest af regelmæssig oval Form. Tuberne, der strækker sig radiært ud, bøier sig alle i en vis Afstand fra Overfladen, men i de forskjelligste Retninger, og danner saaledes et Netværk, der ligger som en Kapsel udenom Gonangie-samlingen.

**Findested.** St. 192, 200 og 322.

**Lafoëa gracillima, Alder.**

(Tab. V, Fig. 2 a).

Syn.: *L. gracillima*, Alder (5), M. Sars (104).

*L. fruticosa*, Allm. (19), Hincks (61, 62), Thomps. (116).

*L. gracillima*, Clarke (36), Markt. Turn. (82).

*L. capillaris*, G. O. Sars (97).

**Trophosome.** Rhizocaulom opret, sammensat, sterkt forgrenet, uden at nogen Del af den fremhæver sig særlig som Stamme. Hydrothekerne lange rørformige, bøiede, med konvexe Side opad, bæres af korte Stilke med 1—2 løse Spiraldreiningen.

**Gonosome.** Coppinia, med lange Tuber, af hvilke de fleste er bøiede nær den distale Ende. De længste er 2 mm. (S. F. Clarke [36]).

**Findested.** St. 18, 48.

**Lafoëa fruticosa, M. Sars.**

(Tab. V, Fig. 2 b, 3).

Syn.: *L. fruticosa*, M. Sars (101, 104), G. O. Sars (97), Markt. Turn. (82), Clarke (36).

**Trophosome.** Rhizocaulom opret, sammensat; Hydrotheker skjævt klokkeformige, idet den Side, som vender opad, er buet, medens den nedre som Regel er ret, bæres paa Stilke med 3—4 Spiralvindinger, og som danner en Vinkel paa mindre end  $60^{\circ}$  med Moderstilken.

**Gonosome.** Coppinia med smaa og uregelmæssig formede Facetter, og med Tuber, der er meget lange og tynde og bøiede i Spiral som en Urfjær.

**Findested.** St. 267, 363, 322. Norsk-øerne.

**Lafoëa symmetrica, n. sp.\***

(Tab. V, Fig. 2 c, 4).

**Trophosome.** Stammen er opret, sammensat, uregelmæssig forgrenet. Hydrotheker fuldstændig symmetrisk klokkeformige med glat, cirkelrund Kant, baaret paa ringede Stilke (6—8 skarpt adskilte Ringe), der danner en Vinkel paa mere end  $60^{\circ}$  med Moderstilken.

Se ogsaa nedenfor, Side 65 og flg.

**Lafoëa abietina, M. Sars.**

(Pl. V, fig. 6).

**Trophosome.** Rhizocaulom compound, erect, very much ramified, though no part is especially prominent as stem. Hydrothecæ tubular with outward-curving margin, forming an angle of  $90^{\circ}$  with the rhizocaulom, from which they are not separated by any constriction.

**Gonosome.** Coppinia, generally of an irregular oval form. All the tubes extending radially from it bend at a certain distance from the surface in all directions, thus forming a net-work lying like a capsule outside the cluster of gonangia.

**Locality.** Stations 192, 200 and 322.

**Lafoëa gracillima, Alder.\***

(Pl. V, fig. 2 a).

Syn.: *L. gracillima*, Alder (5), M. Sars (104).

*L. fruticosa*, Allm. (19), Hincks (61, 62), Thomps. (116).

*L. gracillima*, Clarke (36), Markt. Turn. (82).

*L. capillaris*, G. O. Sars (97).

**Trophosome.** Rhizocaulom erect, compound, very much ramified, though no part of it is specially prominent as stem. Hydrothecæ long, tubular, curved, with the convex side turned upwards, on short stalks with 1 or 2 slight spiral twists.

**Gonosome.** Coppinia, with long tubes, most of which are bent near their distal end. The longest are 2 mm. (S. F. Clarke [36]).

**Locality.** Stations 18 and 48.

**Lafoëa fruticosa, M. Sars.\***

(Pl. V, fig. 2 b, 3).

Syn.: *L. fruticosa*, M. Sars (101, 104), G. O. Sars (97), Markt. Turn. (82), Clarke (36).

**Trophosome.** Rhizocaulom erect, compound. Hydrothecæ obliquely bell-shaped, the upper side being curved, while the lower, as a rule, is straight; borne upon stalks with 3 or 4 spiral twists, and making an angle of less than  $60^{\circ}$  with the parent stem.

**Gonosome.** Coppinia, with small irregular facets and tubes that are very long and thin, and curved in a spiral like a watch-spring.

**Locality.** Stations 267, 363 and 322; Norwegian islands.

**Lafoëa symmetrica, n. sp.\***

(Pl. V, figs. 2 c, 4).

**Trophosome.** Stem erect, compound, irregularly ramified. Hydrothecæ perfectly symmetrical, bell-shaped, with smooth, circular margin, borne upon ringed stalks (from 6 to 8 distinct circles) making an angle of more than  $60^{\circ}$  with the parent stalk.

\* See below, p. 65.



**Gonosome.** Coppinia, med regelmæssig sexkantede Celler i hvis Midte sees en rørformig Aabning. Tuberne er forholdsvis faa, meget tykke og sterkt, men fuldstændig uregelmæssig boiede.

Denne Art blev fundet paa to af Nordh.-Exp.'s Stationer, (Nummer findes desværre ikke paa mere end den ene) i Kolonier paa 3—4 cm.'s Hoide.

Foruden disse blev ogsaa fundet Kolonier med et noget afvigende Udseende af Hydrothekstilkene. Disse er ikke skarpt ringede, men spiraldreiede, som hos *L. fruticosa*, fra hvilken Art de dog skiller sig ved en eiendommelig skarp Boining i sin proximale Del; medens Stilken ved sit Udgangspunkt danner en Vinkel paa  $90^{\circ}$  med Moderstilken, er denne Vinkel efter Boiningen kun  $45^{\circ}$ . Da den baade i Hydrothekernes Form og i sin Coppinia stemmer overens med *L. symmetrica*, opstiller jeg den foreløbig kun som en Varietet af denne Art, — en Varietet, der staar som Overgangstrin til *L. fruticosa*.

**Findested.** St. 313.

### **Lafoëa symmetrica, fruticosa og gracillima.**

(Tab. V, Fig. 2—4).

Da der har hersket Uenighed angaaende Adskillelsen af Arterne *L. fruticosa* og *L. gracillima*, vil jeg i det følgende skarpere pointere, i hvilke Punkter de afviger fra hinanden. I denne Sammenligning tager jeg ogsaa med den nye Art *L. symmetrica*, da den danner et Led i samme Række som de to andre.

I Regelen vil man med det blotte Oie kunne adskille en Koloni af *L. gracillima* fra Kolonier af de to andre Arter, idet *Rhizocaulomets* Udvikling er forskelligt. Hos *L. symmetrica* og *L. fruticosa* har det nemlig i sin Forgrening Lighed med et Træ, idet en Del af det, ved sin oprette Stilling og sin Tykkelse, udmerker sig fremfor de andre som Koloniens Hovedstamme, hvorfra udskyder større og mindre Grene. Hos *L. gracillima* er dette ikke Tilfældet; her er Forgreningen fuldstændig uregelmæssig og ingen Del af Rhizocaulomet karakteriserer sig særlig som Stamme. Flere Gange har jeg seet, at der fra en næsten horisontalt liggende Gren skyder op flere parallelt lobende Skud af samme Tykkelse som det første; men jeg kan ikke udtale dette som nogen almindelig gjældende Regel.

Som noget afgjørende Skillemerke kan Rhizocaulomets Bygning dog ikke betragtes, og til en sikker Bestemmelse kræves en mikroskopisk Undersøgelse.

*Hydrothekerne* og deres *Stilke* er væsentlig forskellige hos de tre Arter:

*L. gracillima*, Alder: Hydrothekstilken gaar ud fra Moderstilken under en Vinkel paa  $30^{\circ}$ — $45^{\circ}$ , har 1 eller 2 meget løse Vindinger og har en Længde omtrent lig Fjerdedelen af Hydrothekerne. Disse er lange, tynde, boiede Rør, hvis øvre og nedre Conturer løber parallele som concentriske Buer, med konvexitet opad. Hydrothekernes Ende-flade (Aabning) er som Regel parallel Moderstilkens Retning.

Den norske Nordhavsexpedition. Kristine Bonnevie: Hydroida.

**Gonosome.** Coppinia, with regular hexagonal facets, in the middle of which is a tubular opening. The tubes are comparatively few in number, very thick and strong, quite irregularly curved.

This species was found at two of the N. Atlan. Exp. stations (the number is unfortunately upon only one), in colonies of 3 or 4 cm. in height.

In addition to these, colonies were also found, in which the hydrothecæ stalks presented a somewhat different appearance. They are not distinctly ringed, but twisted spirally as in *L. fruticosa*, from which species they may be distinguished by a peculiar, sharp curve in their proximal part; at its point of issue, the stalk makes an angle of  $90^{\circ}$  with the parent stem; after the curve, the angle is only  $45^{\circ}$ . As this species agrees with *L. symmetrica* both in the shape of the hydrothecæ, and in its coppinia, I class it, in the mean time, only as a variety of that species, a variety which constitutes a degree in the transition to *L. fruticosa*.

**Locality.** Station 313.

### **Lafoëa symmetrica, fruticosa and gracillima.**

(Pl. V, fig. 2—4).

As there has been disagreement on the subject of the separation of the species *L. fruticosa* and *L. gracillima*, I shall here emphasise more clearly the points on which they differ from one another. In the comparison, I also include the new species *L. symmetrica*, as it forms a link in the same series.

A colony of *L. gracillima* can generally be distinguished with the naked eye from colonies of the other two species, as the development of the *rhizocaulom* is different. In *L. symmetrica* and *fruticosa*, it resembles a tree in its ramification, part of it standing out from the rest on account of its erect position and its thickness, as the chief stem of the colony, whence large and small branches shoot. This is not the case in *L. gracillima*. Here the ramification is altogether irregular, and no part of the rhizocaulom is characterised in any special manner as stem. I have frequently seen several parallel branches shooting up from an almost horizontal one, and of the same thickness; but I cannot bring this forward as a general rule.

The structure of the rhizocaulom, however, cannot be regarded as a decisive distinguishing feature. A microscopical examination is required in order to arrive at definite conclusions.

The *hydrothecæ* and their *stalks* are essentially different in the three species:

In *L. gracillima*, Alder, the hydrotheca stalk rises from the parent stalk at an angle of between  $30^{\circ}$  and  $45^{\circ}$ . It has 1 or 2 very loose twists, and a length of about the fourth part of the hydrotheca. The latter are long, thin, curved tubes, whose sides — (on a median section through the tube) form parallel concentric curves with the convex side turned upwards. The apical surface (opening)



*L. fruticosa*, M. Sars: Hydrothekstilkens Vinkel med Moderstilken er  $45^{\circ}$ — $60^{\circ}$ , dens Længde ca.  $\frac{1}{2}$  Hydrothek, og den har 3—4 tydelige Spiralvindinger. Hydrothekerne har en Mellemting mellem Rør- og Klokkeform, idet deres øvre Væg er tydelig buet, medens den nedre fortsætter uforandret i Stilkens Retning. Hydrothekerne blir saaledes videre ved Mundingen end ved sin Basis. — hvad Sars ogsaa har antydnet i sin oprindelige Diagnose (superne latioribus, inferne coarctatis). — Deres Endeblade staar lodret paa Længderetningen og saaledes ikke parallel Moderstilken.

*L. symmetrica*, n. sp. Hydrothekstilkens Vinkel med Moderstilken lig  $60^{\circ}$ — $90^{\circ}$ ; dens Længde næsten lig Hydrothekernes, og den har 6—8 skarpt adskilte Ringe. Hydrothekerne er regelmæssig klokkeformige, uden nogen Boining.

(Om Varietet med spiraldreiet Stilk, se ovenfor).

Endnu et Middel — og kanske det allersikreste — til at adskille Arterne har man i deres *Coppinia*, men desværre findes ingen Afbildning eller indgaaende Beskrivelse over denne hos *L. gracillima*. Sandsynligvis vil *Coppiniatuberne* hos denne Art ved nærmere Undersøgelse vise sig at være lige karakteristiske for den, som de er det for de øvrige Arter, og isaafald vil enhver Sammenblanding af Arterne for Fremtiden være udelukket.

De her omtalte Arter danner en Kjæde, og man vil ofte i en Koloni af hvilkensomhelst af dem finde enkelte Hydrotheker, der synes at staa paa Overgangen til en af de andre Arter. Men heri finder jeg ikke tilstrækkelig Grund til at slaa Arterne sammen til en, da man altid uden ringeste Vanskelighed kan afgjøre til hvilken Type et Exemplar skal henføres, idet kun en meget liden Procent af Hydrothekerne har en afvigende Form.

For, om mulig, herved at faa klaret disse Arters Synonymi engang for alle, vil jeg give en Fremstilling af Arternes Historie, og herigjennem ogsaa begrunde min Opfatning, at *L. fruticosa*, M. Sars og *L. gracillima*, Alder, er to forskellige Arter.

Prof. M. Sars offentliggjorde i 1849 (101) en kort, men fuldstændig udfyldende, Beskrivelse af *L. (Campanularia) fruticosa*, og i 1857 beskrev J. Alder (5), uden at kjende Sars's Arbejde — sin *L. gracillima*, idet han specielt duede ved denne Arts Adskillelse fra *L. dumosa*. I 1862 (6) udtalte han i en liden Notits, at han ansaa sin Art for identisk med Sars's *C. fruticosa*. Senere har de to Forskere korresponderet om Arterne og udvexlet Exemplarer, og den eneste Udtalelse fra nogen af dem efter denne Sammenligning findes hos Sars 1862 (104), hvor han efter en indgaaende Beskrivelse af sin Art og en Sammenligning af begge, udtaler som sin Mening, at Arterne er forskellige.

of the hydrotheca generally is parallel to the direction of the parent stem.

In *L. fruticosa*, M. Sars, the angle that the hydrotheca stalk makes with the parent stalk is between  $45^{\circ}$  and  $60^{\circ}$ ; its length is about half the hydrotheca, and it has 3 or 4 distinct spiral twists. The hydrothecæ are something between tubular and bell-shaped, their upper wall being distinctly curved, while the lower continues unchanged in the direction of the stalk. The hydrothecæ are thus wider at the mouth than at the base, as Sars has indicated in his original definition — „superne latioribus, inferne coarctatis“. Their apical surface is perpendicular to the longitudinal direction, and thus not parallel to the parent stem.

In *L. symmetrica*, n. sp., the angle which the hydrotheca stalk makes with the parent stem is between  $60^{\circ}$  and  $90^{\circ}$ . Its length is almost that of the hydrotheca, and it has from 6 to 8 clearly defined rings. The hydrothecæ are of a regular bell-shape, without any bend.

(Concerning the variety with a spirally twisted stalk, see above).

There is yet another means — perhaps the surest — of distinguishing the species, viz. by their *Coppinia*: but unfortunately there is no drawing or detailed description of them in the case of *L. gracillima*. It is probable that on a closer investigation, the *Coppinia* tubes in this species will prove to be just as characteristic of it, as they are of the other species; and if this be so, there will be no possibility, in the future, of confounding the species.

The species here mentioned form a chain, and in a colony of any one of them, there will frequently be found hydrothecæ which appear to be at the point of transition to one of the other species; but I do not see in this fact sufficient ground for uniting the species under one, as it can always, without the slightest difficulty, be decided to which type a specimen is to be referred, the percentage of hydrothecæ of a different form being very small.

In order, if possible, definitely to clear up the synonymy of these species, I will give an account of their history, and in so doing also give reasons for my view that *L. fruticosa*, M. Sars and *L. gracillima*, Alder, are two different species.

In 1849, Prof. M. Sars, (101) published a short but full description of *L. (Campanularia) fruticosa*, and in 1857, J. Alder (5), without being acquainted with Sars's work, described his *L. gracillima*, dwelling especially upon the separation of this species from *L. dumosa*. In 1862, he stated in a note (6) that he considered his species to be identical with Sars's *C. fruticosa*. Subsequently the two naturalists corresponded on the subject, and exchanged specimens, and the only statement from either of them after this comparison was from Sars in 1862 (104), when, after a minute description of his species, and a comparison of the two, he expresses it as his opinion that the species are different.

*Hincks* (54 og 57) identificerer Arterne „though not without some doubt“, idet han betviler at forskjellen mellem dem er konstant.

*G. O. Sars* (97) omtaler og afbilder blandt Norges Hydroider baade *L. fruticosa* og *L. gracillima*, idet han protesterer mod *Hincks*'s identification, og tillige en tredje Art, *L. capillaris*, om hvilken han selv udtaler, at det er tvilsomt, hvorvidt den bør staa som selvstændig Art. Efter at have iagttaget hans Originalemplarer af denne Art og sammenlignet dem med talrige Kolonier af *L. gracillima*, maa jeg betragte de to Arter som identiske. Længden af Hydrothekerne hos *L. gracillima* varierer, hvad allerede *Alder* har udtalt, betydelig, og kun ved sine lange Hydrotheker skulde *L. capillaris* skille sig fra denne. Hvad *Sars*'s Afbildninger angaar, da er de desværre ikke fuldt karakteristiske, idet han enten har afbildet lidet typiske Partier af Kolonierne eller ikke har været opmærksom paa den karakteristiske Skjævhed i Hydrothekernes Bygning hos *L. fruticosa* og Boingen af dem hos *L. gracillima*. Specielt er Fig. 17 og 23 Tab. IV vildledende.

Heri maa Grunden søges, naar *Hincks* (61) paastaar, at *G. O. Sars* har taget Feil i sin Opfatning af *L. fruticosa*, *M. Sars*, en Paastand, der allerede paa Forhaand lyder urimelig, da *G. O. Sars* ikke alene stadig arbejdede sammen med sin Fader, men ogsaa havde dennes Materiale til Sammenligning med sit eget. *Hincks* mener, at *G. O. Sars*'s Afbildning gjælder *L. grandis*, *Hincks*, en Form, som endnu ikke er funden blandt Norges Hydroider, og som specielt aldeles ikke forekommer i det af Professorerne *Sars* samlede Materiale. I dette findes derimod talrige Exemplarer af *L. fruticosa*, bestemte dels af *M. Sars* og dels af *G. O. Sars*, der alle er fuldstændig typiske, og af hvilke *G. O. Sars* utvilsomt har benyttet et til sin Afbildning.

*Hincks* (61) holder fremdeles paa sin tidligere udtalte Formodning, at *L. fruticosa* og *L. gracillima* er identiske, og hans Udtalelse har nu saa meget mere Vægt, som han har havt Anledning til at se og afbilde en Koloni af *L. fruticosa*, sendt fra *M. Sars* til *Alder*. Da han ved sine Afbildninger har villet forsvare denne sin Opfatning, har han sandsynligvis søgt efter Overgangsformer i begge Arters Hydrotheker, — som ovenfor udtalt, indrømmer jeg villig, at saadanne findes, — og ingen af hans fem Afbildninger (Fig. 6—10, Tab. VI) viser den fuldt typiske Form. Jeg har forsaavidt en lige fast Grund at staa paa som *Hincks*, naar jeg holder Arterne for forskellige, som jeg har benyttet til min Undersøgelse ikke alene *M. Sars*'s Exemplarer af *L. fruticosa*, men ogsaa de fra *Alder* til ham sendte Kolonier af *L. gracillima* saavel som flere Exemplarer af denne Art, bestemte af *Sars* efter Sammenligning med *Alders* Kolonier.

Samme Aar beskriver *Hincks* (62) blandt Hydroider fra Island en ny Art, *L. grandis*. At dette er en distinct Art, er utvilsomt; men hans Diagnose er ufuldstændig, idet den tildels er taget fra *G. O. Sars*'s Afbildning af *L. fruticosa* ([97], Tab. IV, Fig. 16), da han selv kun havde

*Hincks* (54 & 57) identifies the species, „though not without some doubt“, as he doubts the difference between them being constant.

*G. O. Sars* (97) mentions and gives drawings of both *L. fruticosa* and *L. gracillima* among the hydroids of Norway — protesting against *Hincks*'s identification — and also a third species, *L. capillaris*, about which he himself expresses a doubt as to how far it is entitled to stand as an independent species. After looking carefully at his original specimens of this species, and comparing them with numerous colonies of *L. gracillima*, I am obliged to consider the two species as identical. The length of the hydrothecæ in *L. gracillima* varies, as *Alder* has already stated, considerably, and it is only in its long hydrothecæ that *L. capillaris* is said to differ from it. *Sars*'s drawings are unfortunately not altogether characteristic, as he has either chosen parts of colonies that are not very typical, or has not noticed the characteristic obliquity in the structure of the hydrothecæ in *L. fruticosa*, and their curvature in *L. gracillima*. Figs. 17 & 23, Pl. IV, are especially misleading.

This may explain *Hincks*'s assertion (61) that *G. O. Sars* has been mistaken in his view with regard to *L. fruticosa*, an assertion which, on the face of it, is all the more unreasonable from the fact that *G. O. Sars* not only was constantly working with his father, but also had he latter's collections for purposes of comparison. *Hincks* thinks that *G. O. Sars*'s drawing is of *L. grandis*, *Hincks*, a form which has not yet been found among the hydroids of Norway, and moreover does not occur at all in the collections of Professors *M.* and *G. O. Sars*. On the other hand, there are, in these collections, numerous specimens of *L. fruticosa*, determined partly by *M. Sars*, and partly by *G. O. Sars*, which are all thoroughly typical; and it is undoubtedly one of these that *G. O. Sars* has made use of for his drawing.

*Hincks* (61) still holds to his former supposition that *L. fruticosa* and *L. gracillima* are identical. His statements are here the more important from his having had the opportunity of seeing and making drawings of a colony of *L. fruticosa* sent by *M. Sars* to *Alder*. Having been desirous, by his illustrations, to defend this view, he has probably sought for transition-forms in the hydrothecæ of both species — (as stated above, I readily allow that such do exist) — and none of his five drawings (figs. 6—10, Pl. VI) represents the entirely typical form. I have indeed, as good a ground as *Hincks*, when I separate the species; for in my investigations, I have made use not only of *M. Sars*'s specimens of *L. fruticosa*, but also of the colonies of *L. gracillima* sent to him by *Alder*, as well as of several specimens of this species, determined by *Sars*, after comparison with *Alder*'s colonies.

I the same year, *Hincks* (62) describes among hydroids from Iceland, a new species, *L. grandis*. This is undoubtedly a distinct species, but *Hinck*'s definition is incomplete, being taken partly from *G. O. Sars*'s drawing of *L. fruticosa* ([97] Pl. IV, fig. 16), *Hincks* himself having



Fragmenter af en Koloni til sin Raadighed. At denne Sammenstillen er ugrundet, har jeg ovenfor godtgjort. Han ledsager Beskrivelsen med to Afbildninger ([62], Tab. VI, 1--2), der viser, at *L. grandis* allerede ved sin Størrelse umuliggjør enhver Sammenblanding med de tidligere omhandlede Arter.

Af senere Forfattere har *Thompson* (116) sluttet sig til *Hincks*, medens *Clarke* (36) giver meget karakteristiske Afbildninger af de to omtvistede Former (Tab. VI, Fig. 22 og 24), og *Marktanner Turneretscher* (82) gjør opmærksom paa, at saavel Hydrothekstilkene, som ogsaa selve Hydrothekerne er karakteristiske Skillemerker mellem de to Arter.

***Lafoëa gigantea*, n. sp.**

(Tab. VI, Fig. 2).

**Trophosome.** Rhizocaulom opret, sammensat, meget svagt forgrenet. Hydrotheker 5—8 mm. lange, bægerfor-

only fragments of a colony at his disposal. I have proved above that this comparison is unfounded. He accompanies the description with two illustrations ([62] Pl. VI, figs. 1 & 2) which show that from its size alone, it is impossible to confound *L. grandis* with the previously described species.

Among more recent authors, *Thompson* (116) has sided with *Hincks*, while *Clarke* (36) gives very characteristic drawings of the disputed forms (Pl. VI, figs. 22 & 27), and *Marktanner Turneretscher* (82) points out that both the hydrotheca stalks and the hydrothecæ themselves are characteristic distinctive marks between the two species.

***Lafoëa gigantea*, n. sp.**

(Pl. VI, fig. 2).

**Trophosome.** Rhizocaulom erect, compound, very slightly ramified. Hydrothecæ 5—8 mm. long, cup-shaped,

Fig. 3.



B.



A.

A. En Koloni i naturlig Størrelse med Gonangier.  
B. Gonangium forstørret.

A. A colony (nat. size) with gonangia.  
B. Gonangium enlarged.



mede, fladtrykte i den distale Ende og med sterkt udboiet Kant, bæres paa Stilke af forskjellig Længde, der under forskjellig Vinkel og med store, uregelmæssige Mellemrum gaar ud fra Stammen. Stilkene er sammensat af kortere og længere Led.

**Gonosome.** Gonangier udgaar fra Rhizocaulomet og findes spredt over hele Kolonien. De er ægformede med en kort rørformig Aabning, og paa deres Overflade sees 6—8 langsgaaende Ribber. 5—8 mm. lange.

Jeg henfører denne nye Art til *Lafoëa*, skjønt den i sin Bygning meget lidet ligner de øvrige Arter af denne Slægt. Imidlertid finder jeg ingen specielle Kjendemerker efter hvilke den bør sættes udenfor *Lafoëas* Slægtsdiagnose, og anser jeg det ikke for rimeligt at oprette nogen ny Genus for den. Dens klokkeformige Hydrotheker stiller den, sammen med *L. grandis* og *L. pinnata*, paa Overgangen til *Campanularia*, medens dens Rhizocaulom tyder paa Slægtskab med *Lafoëa*.

Den blev under Nordh.-Exp. funden i flere Exemplarer paa en Station, og er senere af Konservator Appelløf funden ved Moldøen ved Bergen. De fundne Exemplarer har en Højde af 5—10 cm.

Samme Sted blev den Sommeren 1898 atter fundet af Dr. Hjort, og denne Gang i meget store Exemplarer, 15—20 cm. høje. Beskrivelsen af Gonangierne er taget fra disse.

**Findested.** 164.

#### *Lafoëa pinnata*, G. O. Sars.

(Tab. VI, Fig. 1).

**Trophosome.** Hydrocaulus opret, sammensat, med fjærformig Forgrening. Hydrotheker symmetrisk bægerformede, bæres paa en halv-spiraldreiet Stilk, der danner ca. 30° Vinkel med Moderstilk.

**Gonosome.** Scapus. De enkelte Gonangier har i den distale Ende tre rørformige Aabninger, der munder ud paa Siden og danner 120° Vinkel med hinanden.

Denne Art, som tidligere kun er omtalt af G. O. Sars (97), der fandt endel Exemplarer ved Mosterhavn i Hardanger, blev paa Nordh.-Exp. fundet paa flere Steder og i Exemplarer op til 7 cm. høje. Kun et af disse bærer Gonangier; de sidder i Klynge paa en af de nederste Grene, og er endnu ikke fuldt udviklede; men paa et af Prof. Sars's Exemplarer fandt jeg en Scapus med fuldt udviklede Gonangier, der alle havde de eiendommelige tre Aabninger i den distale Ende. Ved Bunden af Hydrothekerne sees et Diaphragma.

**Findested.** St. 200 og 270.

flattened at the distal end, and with a very much outward curving margin, borne upon stalks of various lengths, which branch out from the stem at various angles and at wide, irregular intervals. The stalks are composed of long and short joints.

**Gonosome.** Gonangia issue from the rhizocaulom all over the colony. They are oviform with a short tubular opening, and on their surface are seen 6—8 longitudinal ribs. Length 5—8 mm.

I refer this new species to *Lafoëa*, although it has very little resemblance in its structure to the other species of this genus. I cannot, however, find any special distinguishing features, which would place it outside the generic definition of *Lafoëa*; and I see no reason for establishing a new genus for it. Its bell-shaped hydrothecæ place it, with *L. grandis* and *L. pinnata*, on the transition to *Campanularia*, while its rhizocaulom points to a relationship with *Lafoëa*.

Several specimens were found during the N. Atlan. Exp. at one station, and it has subsequently been found by Curator Appelløf off Moldøen, near Bergen. The height of the specimens found is from 5 to 10 cm.

At the same place this species was found by Dr. Hjort in the summer 1898, and now in very large specimens, 15—20 cm. in height. My description of the gonangia is taken from these colonies.

**Locality.** Station 164.

#### *Lafoëa pinnata*, G. O. Sars.

(Pl. VI, fig. 1).

**Trophosome.** Hydrocaulus erect, compound, with penniform ramification. Hydrothecæ symmetrically cup-shaped, borne upon a half-spirally twisted stalk, which makes an angle of about 30° with the the parent stalk.

**Gonosome.** Scapus. Each gonangium has three tubular apertures at its distal end, opening at the side, and forming an angle of 120° with one another.

This species, which has hitherto been mentioned only by G. O. Sars (97), who found a few specimens at Mosterhavn in the Hardanger Fjord, was found at several places during the N. Atlan. Exp., the specimens being up to 7 cm. in height. Only one of these bears gonangia; they are standing in clusters on one of the lowest branches, and are not yet fully developed. But I found on one of Prof. Sars's specimens, a scapus with fully developed gonangia, which all had the characteristic three openings at their distal end. A diaphragm is visible at the bottom of the hydrothecæ.

**Locality.** Stations 200 & 270.

	Hydrocaulus	Hydrotheker		Arter	Hydrothekernes Stilleke	Gonosome		Findested	
		Aabningsrand	Formforhold*			Udgaar fra:	Form	Norge	N. Ksp. Dybde
Gen. II. Campanularia. Klokkeformige Hydrotheker uden Laag.	Stammen dannes af opretstående Rhizocaulom. Hydrotheker udgaar næsten kransstillet	12-15 spidse Tænder	1:2	<b>C. verticillata</b> , Lin. 57, 79, 107.	Ringes ved Basis og i distale Ende	Fra Rhizocaulom	Flaskelignende formet	Hede Kysten	10-600 m.
			1:5	<b>C. gelatinosa</b> , Pall. 57.				Trendeliefjorden	0-10 m.
		Glat Rand		<b>C. geniculata</b> , Lin. 57.			Urnformet med opretstående Kant om Aabningerne	Hede Kysten	0-10 m.
			9:10	<b>C. dichotoma</b> , Lin. 57.			Fri Meduser		
		Svagt buget Rand	1:1	<b>C. longissima</b> , Pall. 57.	Stilkene har tydelige ringe i hele sin Længde	Fra Vinklerne ved Hydrothekernes stilkenes Udgangs punkt		Lillesand	?
	Enkel Stamme	Glat Rand	3:1	<b>C. flexuosa</b> , Hincks. 57.			Fastsiddende Gonoforer eller Tentakler	Hede Kysten	Littoral
		Buskformig Væxt. Robust Bygning		<b>C. lovenii</b> , Allm. 81, 57.			Omvendt kegelformig. Ingen udviklede Meduser, der ikke løsriver sig, men som dog træder udenfor Gonangiet	Vestlandet—Nordkap	1
		Lave, ved afskaarne Tænder	1:2	<b>C. hyalina</b> , Hincks. 57.			1 Radialkanaler	Trendeliefjorden—Lofoten	10-200 m.
		Meget flad bygget, hyalin	2:5						
		Ca. 12 lange og spidse Tænder	1:3	<b>C. gracilis</b> , M. Sars. 101, 102, 57.	Ringes ved Basis og under Hydrothekerne	Fra Stolon og fra Stamme		Stavanger Nordkap	0-200 m.
(Fortælltes paa Side 72)	(Opretstående forpreget Stamme)	Stiv Bygning; svag uregelmæssig Forøgning. Hvide 10-30 mm.							

\* Tallene angiver Forholdet mellem Aabningens Diameter og Hydrothekernes Længde.

Efter Hucks's Diagnose er det meget vanskeligt at adskille *C. longissima* og *C. glabellata*, idet Forskjellen kun beror paa, at den forstes Hydrotheker har „the margin cut into blunt and shallow teeth“, medens den andens har „an entire margin“. I en og samme Koloni findes stadig Hydrotheker af begge disse Former, og det Virvar, som har hersket i Beskrivelsen over disse Arter tyder ogsaa paa, at en Adskillelse neppe er berettiget. Jeg foreslaar derfor, at begge disse Arter slaas sammen til en.

	Hydrocaulus	Hydrothecæ		Species	Hydrothecæ-stalks	Gonosome		Where found				
		Margin of opening	Form* proportion			Springs from:	Form	Gonophores	N. Atl. Exp.	Depth m.		
Gen. II. Campanularia. Bell-shaped hydrothecæ without lid.	Compound stem	Stem formed of the erect rhizocaulom. Hydrothecæ spring almost in a circle	12-15 pointed denticles	1:2	<b>C. verticillata</b> , Lin. 57, 79, 101.	Rings at base and distal end	Bottle-shaped	Sessile	No radial canals or tentacles	Whole coast	—	10-600
			Smooth margin	4:7	<b>C. gelatinosa</b> , Pall. 57.		Sessile	Tromsø-fjord	0-10			
				9:10	<b>C. geniculata</b> , Lin. 57.							
					<b>C. dichotoma</b> , Lin. 57.							
			Slightly wavy margin	4:7	<b>C. longissima</b> , Pall.** 57.	Distinct rings through-out their entire length	Angles at the points whence the hydrothecæ spring	Western Norway	?			
	Simple stem	Main stem dark brown, high and undulating. Colony pointed at the top	Smooth margin	3:4	<b>C. flexuosa</b> , Hincks. 57.		Sessile	Whole coast	Littoral			
			Low, abruptly truncated denticles	1:2	<b>C. lovenii</b> , Allm. 81, 57.							
				2:5	<b>C. hyalina</b> , Hincks. 57.							
					<b>C. gracilis</b> , M. Sars. 101, 102, 57.							
			About 12 long, pointed denticles	1:3		Rings at base and below hydrothecæ	Stolon and stem	Stavanger to N. Cape	0-200			

(Continued on the next page)

\* The figures give the proportion between the diameter of the opening, and the length of the hydrothecæ.  
It is very difficult from Hincks's definition, to distinguish between *C. longissima* and *C. glabellata*, as the difference between them is only that in the first, the hydrothecæ have their margin cut into blunt and shallow teeth<sup>a</sup>, while those of the second have an entire margin<sup>a</sup>. Hydrothecæ of both kinds are constantly found in the same colony, and the confusion in the descriptions of these species indicate, too, that their separation is scarcely justifiable. I suggest, therefore, that these two species be united.



Fam. Campanularidae.

	Hydrotheke			Arter	Gonangier		Findested	
	Stilkens Bygning	Begrets Bygning	Aabningsrand		Form	Stilling	Gonoforer	Norge   Exp.   Dybde
(Fortsættelse fra Side 70)  Gen. II. <b>Campanularia.</b>  Klokkeformige Hydrotheke uden Laag.	Ingen eller meget svag Forøgning  Krybeude Stole; Krybeude Stole;  Ingen eller meget svag Forøgning	Tydelige Ringe over Stilkens Udspring og under Hydrotheke	Glat klokkeformet; ingen Fortykkelse af Væggen	10-12 spidse Tænder	3:4	<b>C. johnstonii</b> , Alder. 57, 102. **	Største Bredde paa Midten	Hammer-fest   100-300 m.
		Væggen for-tykket i den nedre Del. Klokkeformet	Prismatisk. (Længdelsgribning)	Ret afskaarne Tænder	1:2	<b>C. hincxsii</b> , Alder. 57.	Største Bredde ved nederste Ende	Stavanger   40-200 m.
		Hulrum danner Overgang mellem Bæger og Stilk	Klokkeform. Noget ud-bøjet Rand	Glat Rand	9:10	<b>C. calyculata</b> , Hincks. *** 57.	Omtrønt samme Bredde helt op	Hole Kysten   10-100 m.
		Cylindrerform. med hurtig Afsnævning nederst	Ca. 10 afrundede Tænder	1:2	<b>C. volubilis</b> , Lin. 57.	Flaskeformig med lang Hals	Trondhjem-fjorden   St. 322	Om. 200 m.

\* Tallene angiver Forholdet mellem Aabningens Diameter og Hydrothekeens Længde.

\*\* Syn.: *C. geyenbaurii*, M. Sars.

\*\*\* Den oprindelige *C. calyculata*, har noget længere Hydrotheke (1:1); dette er en Variet *C. cal. breviscapula*, M. Sars.

Fam. Campanularidae.

	Hydrotheca			Species	Gonangia		Where found	
	Struc-ture of stalk	Structure of calyx	Margin of opening		Form	Posi-tion	Gonophores	Norway   Exp.   Depth m.
(Continues the table on p. 71)  Gen. II. <b>Campanularia.</b>  Bell-shaped hydrothece without lid.	Distinct rings above point of issue, and below hydrothece  Loosely spirally-twisted, with a distinct ring below the hydrothece	Smooth, bell-shaped; no thickening of wall	10-12 pointed teeth	<b>C. johnstonii</b> , Alder. 57, 102. **	Irregular oval. Transverse rings with or without keel. Wide opening	Greatest width in middle	Free swimming medusae numerous tentacles	Hammer-fest   100-300
		Lowest part of wall thickened. Spherical cavity forms transition from calyx to stalk	Prismatic. (Longitudinal stripes)	<b>C. hincxsii</b> , Alder. 57.	Prismatic. (Longitudinal stripes)	Greatest width in lowest third		Stavanger to Lofoten   40-200
		Bell-shape somewhat outward curved margin	Smooth margin	<b>C. calyculata</b> , Hincks. *** 57.	Bell-shape somewhat outward curved margin	About same width all way up	Sessile medusoid gonophores No radial canals or tentacles	Whole coast   10-100
		Cylindrical, tapering rapidly below	About 10 rounded teeth	<b>C. volubilis</b> , Lin. 57.	Bottle-shaped with long neck	Bottle-shaped with long neck	Springing from stolon or stem. Short stolon	Trondhjem Fjord   St. 322

\* The figures give the proportion between the diameter of the opening, and the length of the hydrothece.

\*\* Syn.: *C. geyenbaurii*, M. Sars.

\*\*\* The original *C. calyculata* has somewhat longer hydrothece (1:1). This is a variety. *C. cal. breviscapula*, M. Sars.

Gen. II. **Campanularia**

er forholdsvis svagt repræsenteret i Nordh.-Exp.'s Materiale, idet der kun findes en enkel liden Art voxende paa Kolonier af andre Hydroider, nemlig *Campanularia volubilis*, Lin.

**Campanularia volubilis**, Lin.

**Trophosome.** Hydrocaulus enkel, ugrenet, udgaar fra en krybende Hydorrhiza; den er løst spiraldreiet med en tydelig Ring lige under Hydrothekerne. Disse har næsten Cylinderform, smalner hurtig af nederst, og har i Randen ca. 10 afrundede Tænder. Hydrothekernes Længde er omtrent dobbelt saa stor som deres største Bredde.

**Gonosome.** Gonangier flaskeformige med lang Hals, staar ved en kort Stilk fæstet til den krybende Stolo. Gonoforer er fastsiddende.

Denne Art er fundet især paa Arter af Slægten *Halecium*, saaledes paa *H. muricatum* og *H. irregulare*, men ogsaa i Mængde paa *Selaginopsis obsoleta* fra St. 322.

Gen. III. **Campanulina**

omfatter saadanne Campanularider, hvis Hydrotheker lukkes med et Laag.

**Campanulina plicatilis**, M. Sars.

**Trophosome.** Hydrocaulus sammensat, opret, fjær- til vifteformig forgrenet i et Plan. Hydorrhiza en sammenfiltret Masse forgrenede Ror. Hydrotheker lange, rørformig bøiede, med Konvexitet opad, lukkes ved at den øverste Del foldes sammen fra begge Sider mod Diameteren.

**Gonosome.** Gonangier, store cylindriske med cirkelrund Aabning i den distale Ende findes spredt over Kolonien. Væggen beklædt med et chitinost Netværk, dannet af Udlobere fra Grenene.

Denne Art, som tidligere er fundet ved Norges og Grønlands Kyster og indgaaende beskrevet af *M. Sars* og *Levinsen*, blev under Nordh.-Exp. fundet paa tre forskellige Stationer. Jeg har ikke haft Anledning til at iagttage Gonangierne, og ovenstaaende Beskrivelse af dem er givet af *M. Sars*, der dog ogsaa kun havde betragtet dem paa Spiritusexemplarer.

**Findested.** 18, 312 og 357.

**Campanulina producta**, G. O. Sars.

**Trophosome.** Hydorrhiza krybende, ingen opret Stamme; Hydrotheker vider sig svagt ud mod distale Ende og lukkes ved at den øverste hindeagtige Del foldes radiært sammen mod Midten; fuldstændig jevn Overgang til Stilken, der er betydelig længer end Hydrothekerne, og paa hvilken ofte sees nogle faa, utydelige Ringe.

Gen. II. **Campanularia**

This genus is comparatively poorly represented in the N. Atlan. Exp. collection, there being only one small species, growing on colonies of other hydroids, viz. *Campanularia volubilis*, Lin.

**Campanularia volubilis**, Lin.

**Trophosome.** Hydrocaulus simple, unramified, issuing from a creeping hydorrhiza; it is twisted in a loose spiral, with a distinct ring just below the hydrothecæ. The latter are almost cylindrical, taper rapidly below, and have about 10 rounded teeth on their margin. The length of the hydrothecæ is about twice their greatest breadth.

**Gonosome.** Gonangia bottle-shaped, with long necks: stand on short stalks attached to the creeping stolon. Gonophores sessile.

This species is found especially on species of the genus *Halecium*, such as *H. muricatum* and *H. irregulare*, but also in large number on *Selaginopsis obsoleta* from Station 322.

Gen. III. **Campanulina**

will embrace such Campanularidae as have their hydrothecæ furnished with a lid.

**Campanulina plicatilis**, M. Sars.

**Trophosome.** Hydrocaulus compound, erect; penniform to flabelliform ramification in one plane. Hydorrhiza a tangled mass of branching tubes. Hydrotheca long, tubular, curved, the convex side uppermost, is closed by the folding together of the upper thin part from both sides towards the diameter.

**Gonosome.** Gonangia large, cylindrical with circular opening at the distal end; are found scattered over the colony. The wall is covered with a chitinous net-work formed by shoots from the branches.

This species, which was previously found on the coasts of Norway and Greenland, and was minutely described by *M. Sars* and *Levinsen*, was found at three different stations during the N. Atlan. Exp. I have had no opportunity of examining the gonangia, and the above description of them was given by *M. Sars*, who also, however, had only seen them in spirit specimens.

**Locality.** Stations 18, 312 & 357.

**Campanulina producta**, G. O. Sars.

**Trophosome.** Hydorrhiza creeping, no erect stem. The hydrothecæ expand slightly towards their distal end, and are closed by the folding together towards the centre of the upper, membranous portion; perfectly even transition to the stalk, which is considerably longer than the hydrothecæ, and upon which a few indistinct rings may often be seen.



Fam. Campanularidae.

	Hydrocaulus	Hydrothek-laa	Arter	Hydrocaulus	Hydrotheker		Gonangier	Findested	
					Form	Laag		Norge	Nordh.-Exp.
Gen. III. Campanulina. Klokke- eller rørformige Hydrotheker, lukkede ved Folding af den distale Del	Opret Stamme	Sammen-sat	α. Laag ki-leformet, Aabnes efter Midt-linien	C. plicatilis, M. Sars. 104, 79.	Vifteformig For-grening i et Plan	Siddende, Lange boiede, med konvexe Side opad, Hyalin Bygning	Cylindrisk. Rund Aabning i dist. Ende Væggen klædt med Netværk, dannet af Udløbere f. Grenene. 4—5 mm. lange	Hele Kysten	10—400 m.
				β. Laag plade- eller kegle-formet; aabnes i Midt-punktet	Korte Sidegrene, der flere Gange deles dichotomisk. Ringe over hver Deling	β. Øverste Del af Hydrothek er foldet sammen ind mod Centrum, og danner saabedes et kegle eller tragtformigt Laag, der tilsyneladende er sammensat af adskilte spidse Tænder	Meget store cylindriske, med kort Stilk; findes langt nede paa Hovedstammen	Kristiania-fjorden, Bergen	100—200 m.
		Enkel	C. producta, G. O. Sars. 97, 112.	Stilken har indtil 6 Gange Hydrothekernes Længde	I mærkelig Overgang fra Stille til Hydrothek	α. Det faste Chitindække hæver sig op i to spidse Tænder, og i de buformede Indskjæringer mellem disse er udspændt tynde Hinder, der kan foldes sammen med Diatomeer mellem Tændernes Spids	Cirkelrunde, noget fladtrykte, med kort rørformig Munding (Glatte)	Bodo, Lakfoten	100—400 m.
	Krybende Stole	Stilke betydelig længere end Hydrotheker	C. pedicellaris, n. sp. *	Stilk omtrent dobbelt saa lang som Hydrothek			Uregelmæssig omvendt kegleformig, med to ovale Sporophorer	Triljens-fjorden	?
			C. fastigata, Alder. 57.	Stilkene meget korte uden Ringe			Ukjendt	Aalesund	100—200 m.
		Stilke kortere end Hydrotheker	C. syringa, Lin. 57.	Stilk kan opaa samme Længde som Hydrothek, 3—4 Ringe	Cylindrisk med svagt udboiet Kant	Som β	Oval, glat, stuaar paa en kort ringet Stilk. Ydre Marsupium	Hele Kysten	40—200 m.

\* „Neue norwegische Hydroiden“, Bergens Museums Aarbog. 1898.

Gen. IV.

Lafœina.

Syn.: Oplorhiza, Allm.

Sp. L. tenuis, M. Sars (G. O. Sars, 97).



Fam. Campanularidae.

	Hydrocaulus	Hydrotheca-lid	Species	Hydrocaulus	Hydrotheca		Gonangia	Where found	
					Form	Lid		Norway	N. Atl. Exp.
Gen. III. <b>C a m p a n u l i n a.</b> Bell shaped or tubular hydrotheca, closed by folding of the distal part.	Erect stem	Compound	<b>C. plicatilis</b> , M. Sars. 104, 79.	Fan-shaped ramification in one plane	Sessile. Long curved, with convex side uppermost. Hyaline structure	Like $\alpha$	Cylindrical. Round opening at distal end. Wall covered with net-work formed of shoots from branches 4—5 mm. long	Whole coast	10 100
			<b>C. panicula</b> , G. O. Sars. 97, 112.	Short lateral branches, divided several times dichotomously. Rings above each division	Imperceptible transition from stalk to hydrotheca	$\beta$ . Upper part of hydrotheca folded together in towards the centre, thus forming a conical or funnel-shaped lid, apparently composed of separate pointed teeth	Kristiania Fjord to Bergen	100 200	
			<b>C. producta</b> , G. O. Sars. 97, 112.	Length of stalk up to 6 times that of hydrotheca			Bodo, Lofoten	100 400	
	Creeping stolon	Stalks much longer than hydrotheca	<b>C. pedicellaris</b> , n. sp. *	Stalk about twice the length of hydrotheca		$\alpha$ . The firm chitinous sheath rises in two pointed teeth, and in the arcuate indentations between them are stretched thin membranes, that can be folded together towards the diameter between the points of the teeth	Tromsø Fjord	?	
			<b>C. fastigata</b> , Alder. 57.	Stalks very short, without rings		Unknown	Alesund	100 200	
			<b>C. syringa</b> , Lin. 57.	Stalk may attain same length as hydrotheca. 3 or 4 rings	Cylindrical with slightly outward-curving margin	Like $\beta$	Whole coast	40 200	
	Scattered over the colony								
	Gonangia								
	Cylindrical. Round opening at distal end. Wall covered with net-work formed of shoots from branches 4—5 mm. long								
	Very large, cylindrical, with short stalk, found far down on main stem								
	Circular, somewhat compressed, with short tubular opening. Smooth								
	Irregularly obconical, with two oval spots								
	Unknown								
	Oval, smooth, stands on short, ringed stalk. External marsupium								

„New norwegische Hydroiden“, Bergen Museum Year-book. 1898.

Gen. IV.

Lafoëina.

Syn.: *Opelochiza*, Albm.

Sp. *L. tenuis*, M. Sars (G. O. Sars, 97).

**Gonosome.** Gonangier udgaar fra Stolonen, og er glatte, cirkelrunde, noget fladtrykte fra Siderne, med en kort Munding.

Denne Art er tidligere fundet af *G. O. Sars* ved Bodø og Lofoten, og af *Storm* i Trondhjemsfjorden paa et Dyb af 80—250 Favne. *Sars's* Exemplarer var, ligesom det paa Nordh.-Exp. fundne, uden Gonangier, og ovenstaaende Beskrivelse af disse er givet af *Storm*, der saa dem paa enkelte af de i Trondhjemsfjorden fundne Exemplarer.

**Findested.** Ukjendt.

### Fam. Sertularidae.

*Hydranther* spindelformige med traaformede Tentakler i en Kreds. Hydrothekeer rør- eller bægerformige, altid siddende, og i mere eller mindre intim Forbindelse med Hydrocaulus; denne er stadig forgrenet, og Grenene oftest alternerende.

Indenfor denne Familie, ligesom inden Fam. Campanulinidae, har *Levinsen* gennemført en Slægtsinddeling grundet paa Beskaffenheden af Hydrothekeernes Laag. Men ogsaa her maa jeg fastholde, hvad jeg udtalte tidligere, nemlig at Laagets og Hydrothekekrandens Beskaffenhed er meget gode Artsmerker, men at grunde et System paa disse Karakterer vil være at tillægge dem en altfor stor Betydning.

*Schneider* lader alle Familiens Arter kun danne en eneste Slægt, *Sertularia*, medens han dog af praktiske Hensyn opstiller flere Grupper indenfor denne, og denne Gruppeinddeling baserer han paa Hydrothekeernes Anordning paa Grenenes Internodier.

Jeg finder ogsaa, at Grænserne mellem de Slægter, der er opstillet i de forskellige Systemer er altfor løse, til at Slægterne skal kunne blive staaende, og de forskellige Arter af *Sertularider* danner en fuldstændig sluttet Række. Jeg deler derfor *Schneider's* Opfatning, at hele Familien danner én Slægt, hvis Arter kan inddeles i forskellige Grupper.

#### *Sertularella gayi*, Lamx.

**Trophosome.** Hydrocaulus sammensat, Grene alternerende, men med uregelmæssig Afstand. Hydrothekeer bægerformige, glatte eller med nogle Rynker paa Tvers og 4 Tænder regelmæssig fordelte om Aabningen.

**Gonosome.** Gonangier ægformede med Rynker i den distale Del og 2 Tænder om Aabningen.

Et Par Exemplarer af denne Art, 4—6 cm. høje, blev fundet under Nordh.-Exp. sammen *Thuiaria filicula*. Stationens Nummer er desværre ikke bevaret.

**Gonosome.** Gonangia on the stolon, smooth, circular, somewhat compressed at the sides, with a short aperture.

This species was previously found by *G. O. Sars* at Bodø and Lofoten, and by *Storm* in the Trondhjem Fjord at depths from 80 to 250 fathoms. *Sars's* specimens, as also those found in the N. Atlan. Exp. were without gonangia, and the above description of them was given by *Storm*, who saw them in a few of the specimens found in the Trondhjem Fjord.

**Locality.** Unknown.

### Fam. Sertularidae.

*Hydranths* spindle-shaped, with filiform tentacles in a circle. Hydrothecæ tubular or cup-shaped, always sessile and more or less intimately connected with the hydrocaulus, which is always ramified, the branches being generally placed alternately.

In this family, as in *Campanulinidae*, *Levinsen* has made a division of genera, based upon the nature of the lid of the hydrothecæ. But the remark that I made previously is also applicable here, namely, that the nature of the lid and of the margin of the hydrotheca, are very good specific distinguishing features, but that in basing a system upon these characters we ascribe to them too much importance.

*Schneider* makes all the species of the family form one single genus, *Sertularia*, while for practical reasons, he sets up several groups within this genus, basing his division upon the arrangement of the hydrothecæ on the internodes of the branches.

I consider too, that the dividing lines between the genera that have been established in the various systems, are too uncertain to allow of their being retained; and the various species of *Sertularidae* form an unbroken series. I therefore adhere to *Schneider's* view that the whole family forms one genus whose species can be arranged in various groups.

#### *Sertularella gayi*, Lamx.

**Trophosome.** Hydrocaulus compound, branches alternating, but at irregular intervals. Hydrothecæ cup-shaped, smooth or with transverse wrinkles, and 4 teeth, at equal distances from one another, round the opening.

**Gonosome.** Gonangia oviform with wrinkles at the distal end, and two teeth at opposite sides of the opening.

Two or three specimens of this species, 4—6 cm. high, were found during the N. Atlan. Exp. together with *Thuiaria filicula*. The number of the station has unfortunately not been preserved.

Fam. Sertularidae.

	Hydrocaulus		Arter	Hydrocaulus		Gonangier		Findested	
	Aabning	Form		Forgrening	Hoide	Form	Aabning	Norge	Nordh-Exp. Dybde
Gruppe I. <b>Sertularella.</b> 1 Hydrothek paa hvert Internodium. Mere end 2 Tænder paa Hydrothekranden.	Sammen-sat	4 Tænder om Aabningen	Bægerformig. Glat eller svagt rynket paa Tvers	Grene alternerende, uregelmæssig Afstand mellem dem	100—300 mm.	Ægformig; rynket i dist. Ende	2 Tænder om Aabningen	Stavanger — Lofoten	? 40—200 m.
	Enkel	Tøndeformig	Aabningen skjævt beliggende	Uregelmæssig Forgrening	30—100 mm.	Oval; rynket i hele sin Længde	4 Tænder om Aabningen	Bergen — Vadsø	St. 322 0—100 m.
			Aabning lodret paa Hydrothekets Længdese						
	3 Tænder om Aabningen	Rørformig. Udvidet mod den distale Ende	<b>S. tenella</b> , Alder. 57.	Oftest ugrenet	10—20 mm.	Eg. eller spindel-formig. Sterkt rynket	Sial rørformig Aabning	Triljøns-fjorden	— ?
			<b>S. tricuspidata</b> , Alder. 57.	Alternerende Grene	30—50 mm.			Bergen — Nordkap	St. 175, 322, 341, 353. 30—2500 m.

Fam. Sertularidae.

	Hydrocaulus		Species	Hydrocaulus		Gonangia		Where found		
	Opening	Form		Ramification	Height	Form	Opening	Norway	N. Atl.-Exp.	Depth m.
Gruppe I. <b>Sertularella.</b> 1 hydrotheca on each internode. More than 2 teeth on the margin of the hydrotheca.	Compound	Cup-shaped. Smooth. or slightly wrinkled transversely	<b>S. gayi</b> , Lamx. 57.	Branches alternating; distance between them irregular	100—300 mm.	Oviform; distal end wrinkled	2 teeth at the opening	Stavanger to Lofoten	?	40—200
	Simple	Barrel-shaped	<b>S. polyzonias</b> , Lin. 57.	Irregular	30—100 mm.	Oval; wrinkled throughout	4 teeth round opening	Bergen to Vadsø	Station 322	0—100
	3 teeth round the opening	Tubular. Expanded towards distal end	<b>S. tenella</b> , Alder. 57.	Generally none	10—20 mm.	Oviform or spindle-shaped. Much wrinkled	Narrow tubular opening	Trondhjem Fjord	—	?
			<b>S. triscuspidata</b> , Alder. 57.	Alternating branches	30—50 mm.			Bergen to N. Cape	Stations 175, 322, 341, 353. 30—2500	



**Sertularella polyzonias, Lin.**

**Trophosome.** Hydrocaulus enkel, med uregelmæssig Forgrening. Hydrotheker bægerformige, glatte, med 4 Tænder om Aabningen.

**Gonosome.** Gonangier ovale, rynkede i hele sin Længde, med 4 Tænder om Aabningen.

Denne Art blev funden i store sammenfiltrede Kolonier paa to Stationer, hvoraf den ene er ukjendt.

**Findested.** St. 322.

**Sertularella tricuspidata, Alder.**

**Trophosome.** Hydrocaulus enkel, alternerende Grene. Hydrothek rørformig, udvidet mod distale Ende, med tre Tænder, regelmæssig fordelt om Aabningen.

**Gonosome.** Spindelformige Gonangier, sterkt rynket trersover, med en smal rørformig Aabning.

Fra ikke mindre end 5 forskellige af Nordh.-Exp.'s Stationer findes smukke Exemplarer af denne Art. Kolonierne har en Høide af 4—12 cm., og de fleste har en meget regelmæssig fjærformet Forgrening.

**Findested.** St. 175, 322, 341, 353. Jan Mayen.

**Dynamena.**

Af Gruppen *Dynamena* forekommer kun to tidligere kjendte Arter, nemlig *D. fallax* og *tamarisca*, men begge disse paa flere Steder. Desuden findes ogsaa en ny Art, *D. unilateralis*.

**Dynamena fallax, Johnst.**

**Trophosome.** Hydrocaulus enkel, med alterneret stillede Grene. Hydrotheker rørformige, med en glatrandet, oval Aabning, hvis Plan danner en spids Vinkel med Længdeaxen. Længden af Hydrothekernes divergerende Del er omtrent lig deres Bredde.

**Gonosome.** Gonangier store, med 4 Ribber udvendig (mindre udviklet hos Han end hos Hun), der forlænges udenfor Gonangiets distale Ende til 4 ligestore Blade, der danner et Slags Kammer udenfor dette.

Blandt de hjembragte Kolonier af denne Art, er enkelte meget store, 15—20 cm. høje, og smukt forgrenede.

**Findested.** St. 303?, 315, 322.

**Dynamena unilateralis, n. sp.**

(Tab. VII, Fig. 5).

**Trophosome.** Hydrocaulus enkel, Grene uregelmæssig alternerende, Hydrotheker rørformige, noget smalere ved Munden end ved Basis, med cirkelformig, glatrandet Aabning, hvis Plan staar lodret paa Grenenes Længdeaxe.

**Sertularella polyzonias, Lin.**

**Trophosome.** Hydrocaulus simple, with irregular branching. Hydrothecæ cup-shaped, smooth, with 4 teeth about the opening.

**Gonosome.** Gonangia oval, wrinkled throughout their length, with 4 teeth about the opening.

This species was found in large, tangled colonies at two stations, one of which is unknown.

**Locality.** Station 322.

**Sertularella tricuspidata, Alder.**

**Trophosome.** Hydrocaulus simple, alternating branches. Hydrothecæ tubular, expanded at the distal end, with three teeth at regular intervals round the opening.

**Gonosome.** Spindle-shaped gonangia, very much wrinkled across, with a narrow, tubular opening.

There are fine specimens of this species from no less than 5 different stations of the N. Atlan. Exp. The colonies have a height of from 4—12 cm., and most of them have a very regular pinnate extension.

**Locality.** Stations 175, 322, 341 and 353; Jan Mayen.

**Dynamena.**

Only two previously known species of the group *Dynamena* occur, namely *D. fallax* and *D. tamarisca*, but both of them in several places. There is also a new species, *D. unilateralis*.

**Dynamena fallax, Johnst.**

**Trophosome.** Hydrocaulus simple, with alternating branches. Hydrothecæ tubular, with a smooth-edged oval opening, whose plane makes an acute angle with the long axis. The length of the divergent portion of the hydrotheca is about equal to its breadth.

**Gonosome.** Gonangia large, with 4 external ribs (less developed in the male than in the female), which are produced beyond the distal end of the gonangium, in the shape of 4 equal leaves, forming a kind of comb.

Among the colonies of this species brought home, a few are very large — from 15 to 20 cm. in height — and beautifully branching.

**Locality.** Stations 303(?), 315 and 322.

**Dynamena unilateralis, n. sp.**

(Pl. VII, fig. 5).

**Trophosome.** Hydrocaulus simple, branches alternating irregularly. Hydrothecæ tubular, somewhat narrower at the mouth than at the base, with circular smooth-edged opening, whose plane is at right angles to the long axis of the branch.

Fam. Sertularidae.

	Hydrocaulus	Hydrothek	Gonangier	Arter	Høide	Hydrothek	Gonangier	Findested	
								Norge	Nordh.-Dybd. Exp.
Gruppe II. <b>D y n a m e n a.</b> 1 Par Hydrotheker paa hvert Internodium.	Greene modsatte	To Tænder, i Kanten forbundet ved en tynd Hinde	Pareformet. Glat	<b>D. pumila</b> , Lin. 57.	20—50 mm.	Nøiagtig modsat stillede	Rørformig Aabning	Hele Kysten	Littoral
		3 Tænder, (en spids midt foran og en ganske liden paa hver Side)		<b>D. operculata</b> , Lin. 57.	200—300 mm.	Meget kort Hals		—	?
		Cirkelformig Aab- ning; glat Kant, der staar lodret paa Greeneres Længdeaxe		<b>D. unilateralis</b> , n. sp.	60—100 mm.	Tilløb til ensidig Aa- bning		—	38 m.
	Greene alter- nerende; ofte dichoto- misk delte	Aabning oval med glat Kant, danner spids Vinkel med Længdeaxen		<b>D. fallax</b> , Johnst. 57.	70—150 mm.	Længden af divergerende Del lig Bredden	Haa: Ribber mindre udviklet end hos Hun	Kristiania- fjorden Tromsø	St. 303, 40—2200 315, 322 m.
		Tre lige store Tænder jævnt for- delt om Aabningen	Ribber udvendig	<b>D. rosacea</b> , Lin. 57.	70—150 mm.	Længden af divergerende Del dobbelt af Bredden		Tananger	— ?
			3 Ribber; danner Ud- gangspunkt for Spise	<b>D. tamarisca</b> , Lin. 57.	100—300 mm.	Modsat stillede	Haa: Sammentrykt, rørformig Aabning med en liden Spids paa hver Side	Kristian- sand Hæmmer- fest	St. 129, 200 1100—1200 m.

Fam. Sertularidae.

	Hydrocaulus	Hydrothecæ	Gonangia	Species	Height	Hydrothecæ	Gonangia	Where found	
								Norway	N. Atl. Exp. Depth m.
Group II.  D y n a m e n a.  1 pair of hydrothecæ on each internode.	Branches opposite	Two teeth on the margin, connected by a thin membrane	Pear-shaped, Smooth	<b>D. pumila</b> , Lin. 57.	20—50 mm.	Placed exactly opposite one another	Tubular opening	Whole coast	— Littoral
		3 teeth, one pointed one in the middle in front, and one very small one on each side		<b>D. operculata</b> , Lin. 57.	200—500 mm.	Bottle-shaped. Very short neck			?
		Circular opening; smooth margin, at right angles to long axis of branch		<b>D. unilateralis</b> , n. sp.	60—100 mm.	Tendency to one-sided arrangement		—	Station 322 38 m.
	Branches alternating; often dichotomously divided	Opening oval with smooth margin, makes an acute angle with the long axis	Ribbed externally	<b>D. fallax</b> , Johnston. 57.	70—170 mm.	Length of diverging portion equal to breadth	<i>Male</i> . Ribs less developed than in female	Kristanna Fjord to Tromsø	Stations 303, 315, 322 40—2200 m.
				<b>D. rosacea</b> , Lin. 57.	70—150 mm.	Length of diverging portion equal twice its breadth		Tanger	— ?
		Three equal-sized teeth round the margin, at regular distances from one another	3 ribs, forming points whence spines issue	<b>D. tamarisca</b> , Lin. 57.	100—300 mm.	Placed opposite one another	<i>Male</i> . Compressed, tubular opening, with a little point on each side	Kristiansund to Hammerfest	Stations 129, 200 1100—1200 m.



**Gonosome.** Gonangier pæreformede, glatte, med en kort rørformig Aabning.

Af denne Art, som ikke tidligere er beskrevet, fandtes under Nordh.-Exp. nogle Kolonier paa en enkelt Station.

Kolonierne har en Hoide af 8—10 cm. og er temmelig tæt besatte med Grene, der i Koloniens proximale Del udgaar nogenlunde regelmæssig alternerende, og i et Plan. I den distale Del derimod udgaar Grene i alle Retninger, og de er atter selv forgrenede i Planer, der ligger lodret paa Koloniens oprindelige Plan, og denne faar saaledes et eiendommeligt buskformigt Udseende. Hovedstammen er enkel, og utydelig leddelt og bærer, ligesom alle Grene, Hydrotheker. Grenene har tydelige Led, der er stillet lodret paa deres Længdeaxe, og hvert Internodium bærer et Par eller, mod Grenenes Spids, kun en Hydrotek.

Grenenes to Hydrothekrækker ligger ikke i samme Plan, men deres Planer danner en Vinkel paa ca. 90° med hinanden, saa at naar man ser en Gren fra Siden, har man alle Hydrotheker udmundende paa samme Side af denne. Grenene faar saaledes en Forside (med Hydrothekmundinger) og en Bagside. De horizontalt udbredte Grene i Koloniens distale Del har alle sin Forside vendt opad, mod Koloniens Spids. I Vinkelen ved Basis af Grenene sees altid en Hydrotek.

De to Hydrotheker, som staar paa samme Internodium og danner et Par, staar ikke i samme Hoide, idet som Regel den, der befinder sig paa Internodiets venstre Side (seet langs Grenenes Forside fra dens proximale mod den distale Ende), er mere distalt beliggende end den anden.

Hydrothekerne er nærmest flaskeformige, idet deres nederste Del er opsvulmet; deres cirkelrunde Aabning staar lodret paa Grenenes, — og saaledes ikke paa deres egen — Længdeaxe.

Gonangier findes i tætte Rækker paa Forsiden af Grenene, mest i Koloniens distale Del. De er pæreformede, næsten ret afskaarne i den distale Ende og med en meget kort rørformig Aabning.

**Findested.** St. 322.

### *Dynamena tamarisca*, Lin.

**Trophosome.** Hydrocaulus enkel, Grene alternerende. Hydrotheker rørformige, modsat stillede, med tre ligestore, stumpe Tænder om Randen.

**Gonosome.** *Han:* Sammentrykt fra Siderne, med en rørformig Aabning og en liden Spids paa hver Side af denne. *Hun:* Pæreformet med tre Ribber udvendig, der i den distale Del danner Basis for endel spidse Tænder, der rager frem over Mundingen.

**Gonosome.** Gonangia pear-shaped, smooth, with a short tubular opening.

During the N. Atlan. Exp. a few colonies of this species, which has not been previously described, were found at one station.

The colonies are from 8 to 10 cm. high, and are rather thickly beset with branches, which, in the proximal part of the colony, alternate with a certain regularity, and in one plane. In the distal portion, on the other hand, the branches stretch in all directions, and branch in their turn in planes which are at right angles to the original plane of the colony, thus imparting a peculiarly bushy appearance to the colony. The chief stem is single and indistinctly articulated, and, like all the branches, bears hydrothecæ. The branches are distinctly jointed, the joints being placed at right angles to their long axis, and each internode bears a pair of hydrothecæ, or towards the end of the branch, one.

The branches' two rows of hydrothecæ do not lie in the same plane, but their planes form an angle of about 60° with one another, so that in a side view of a branch, all the hydrothecæ open upon one side. The branches thus have an anterior and a posterior side, the anterior having the openings of the hydrothecæ. The horizontal branches in the distal portion of the colony have their anterior side turned upwards, towards the apex of the colony. There is always a hydrotheca in the angle at the base of the branches.

The two hydrothecæ that stand on the same internode, and form a pair, are not exactly opposite one another; for, as a rule, the one on the left side of the internode (looking along the anterior side of the branch, from its proximal towards its distal end), is more distally situated than the other.

The hydrothecæ are almost bottle-shaped, their lower portion being swollen; and their circular opening is perpendicular to the branch's, and therefore not to their own, axis.

Gonangia are found in close rows upon the anterior side of the branch, chiefly in the distal part of the colony. They are pear-shaped, almost abruptly truncated at their distal end, and with a very short tubular opening.

**Locality.** Station 322.

### *Dynamena tamarisca*, Lin.

**Trophosome.** Hydrocaulus simple, branches alternating. Hydrothecæ tubular, placed opposite one another, with three equal, blunt teeth on the margin.

**Gonosome.** Male: compressed laterally, with a tubular opening, and a little spike on each side of it; female: pear-shaped, with three external ribs, which form, in their distal portion, the foundation for some pointed teeth, which project over the opening.

Fam. Sertularidae.

Hydrocaulus	Hydrothek	Arter	Hydrocaulus	Hydrotheker	Gonangier	Findested			
Gruppe III. <b>Thuiaria.</b> Mere end to Hydrotheker paa hvert Internodium. Hydrothek-Rand glat eller med en eller to Tænder	Distale 1/3 af den ydre Væg divergerer sterkt	Aabningen oval; den ydre Kant noget ombojet	<b>T. alata</b> , Hincks. 57.	Hovedstammen bestående af tykkere end Grenene	<div>Has: 4 Spidse i distale Ende</div> <div>Has: 4 Ribber, hver med to Pigger</div> <div>Rorformig Aabning</div>	Norge	Dybde		
						Stavanger	100—200 m.		
	Rorformig	Glat, cirkelrund Aabning	<b>T. pinaster</b> , Ell. & Sol. 44, 4, 57.	Hovedstamme og Grenene omfrent lige tykke	Mødsat stillede	Ulyendt	—	?	
			<b>T. elegans</b> , (G. O. Sars, 97.	Udgaar fra Hydrothek, dannet af lange, svagt forgyndede Træder, der kun har enkelte Steder er løstet til Underlaget	200—300 mm.		Stavanger	300—400 m.	
	Hele Hydrothekene divergerer distale Del	To Tænder om Aabningen	<b>T. tenera</b> , (G. O. Sars, 97.	50—100 mm.	Alternerende	Rorformig Aabning	Stavanger	200—300 m.	
			<b>T. argentea</b> , Ell. & Soll. 44, 43, 57.	Hovedstammen stikakbøjet; en Hydrothek udgaar fra hver Bøining			Papirform, en eller to Spidse overst	40—100 m.	
	Flaskelignende	Glat, cirkelrund Aabning	<b>T. abietina</b> , Lin. 43, 57.	50—300 mm.	Modette	Rorformig Aabning	Bergen — Nordkap	40—100 m.	
			<b>T. filicula</b> , Ell. & Sol 57.				Papirformet, Glat	40—300 m.	
			<b>T. articulata</b> , Pal. 57.				Fjerpermet	Kristiansund — Nordkap	10—300 m.
			<b>T. thuja</b> , Lin. 57.				Hydrotheker forgyndet i et Plan lodret paa Stammens Længderetning	Alternerende	Aalesund — Nordkap

Fam. Sertularidae.

	Hydrocaulus	Hydrotheca	Species	Hydrocaulus	Hydrotheca	Gonangia	Where found			
Group III. <b>Thuiaria.</b> More than two hydrothecae on each internodium. Hydrotheca-margin smooth or with one or two teeth.	Rami- fication in one plane	Tubular	Distal 1/3 of external wall diverges greatly	Opening oval; outer margin somewhat curved back	<b>T. alata</b> , Hincks, 57.	Main stem considerably thicker than branches	200—300 mm.	Male: 1 point at the distal end Female: 1 ribs, 2 spines each with near distal end (Vittiform. Tubular opening)	Norway N. Atl. Exp. Depth m	
			Smooth circular opening	Two teeth at the opening	<b>T. pinaster</b> , Ell. & Soll 44, 4, 57.	Main stem and branches of equal thickness	200—300 mm.			
					<b>T. elegans</b> , G. O. Sars, 97.	Grows from a hydrotheca, formed of long, slightly ramified threads which are only here and there attached to substratum	50—100 mm.			
			Distal portion of whole hydrotheca diverges	1 pointed tooth on the margin	<b>T. tenera</b> , G. O. Sars, 97.	Main stem zigzagged; one hydrotheca grows from each bend	20—40 mm.			
					<b>T. argentea</b> , Ell. & Sol. 44, 43, 57.		50—100 mm.			
			Bottle-shaped	Turning outwards Turning towards the stem	<b>T. abietina</b> , Lin. 43, 57.	Round opening	Pinnate	Opposite		
					<b>T. filicula</b> , Ell. & Sol. 57.					
			Branches all round the stem	Imbedded in the stem	Round opening Oval opening	<b>T. articulata</b> , Pal. 57.	Hydrocladium ramified in a plane at right angles to long axis of hydrocaulus	Pinnate	Alternating	Station 261 Kristiansund to N. Cape Alesund to N. Cape 10—200
						<b>T. thuja</b> , Lin. 57.				



Smaa Kolonier af denne Art, 3—5 cm. høje, fandtes sammen med *Lafoëa abietina* paa to af Nordh.-Exp.'s stationer.

**Findested.** 192. 200.

#### **Thuiaria pinaster, Ell. & Sol.**

**Trophosome.** Hydrocaulus enkel, Grene alternerende i et Plan; Hovedstamme og Grene er omtrent lige tykke. Hydrotheker rørformige, modsat stillede, divergerer sterkt med sin distale Del, har en glat, cirkelrund Aabning.

**Gonosome.** Ægformet. *Han*: med 4 Spidser i den distale Ende; *Hun*: med 4 Ribber, der hver bærer to Pigge nær den distale Ende. Begge Kjønns Gonangier har en rørformig Aabning.

En liden (ca. 5 cm. høi) Koloni af denne Art medbragtes fra Nordh.-Exp. Stationens Nummer er ikke bevaret.

#### **Thuiaria filicula, Ell. & Sol.**

**Trophosome.** Hydrocaulus enkel, Forgrening alternerende i et Plan. Hovedstammen zikzakbøiet, en Gren udgaar fra hver Bøining. Hydrotheker flaskeformige, modsat stillede, divergerer med sin distale Del; Aabningen er glat, cirkelrund, og dens Plan staar lodret paa Grenenes Længderetning.

**Gonosome.** Gonangier pæreformede med en rørformig Aabning.

Af denne Art fandtes ligeledes kun en enkel liden Koloni, ca. 4 cm. høi og svagt forgrenet.

**Findested.** St. 262.

#### **Thuiaria articulata, Pal.**

**Trophosome.** Hydrocaulus enkel; Forgrening alternerende i et Plan. Hydrotheker flaskeformige, alternerende stillet og helt indleirede i Grenen, med cirkelrund Aabning.

**Gonosome.** Gonangier pæreformede med rund Aabning, der lukkes med et Laag.

Et Par meget pene Kolonier, 7—10 cm. høje, fandtes sammen med *Lafoëa gracillima*.

**Findested.** St. 267.

#### **Thuiaria argentea, Ell. & Sol.**

**Trophosome.** Hydrocaulus enkel, Forgrening i et Plan; Hovedstammen zikzakbøiet med Grene udgaaende fra hver Bøining. Hydrotheker flaskeformede, alternerende stillet; Aabningen, der har en spids Tand i Kanten, er rettet udad.

**Gonosome.** Gonangier pæreformede med en eller to Spidse i den distale Ende og rørformig Aabning.

**Findested.** Ukjendt.

Small colonies of this species, 3—5 cm. high, were found with *Lafoëa abietina* at two of the N. Atlan. Exp. stations.

**Locality.** Stations 192 and 200.

#### **Thuiaria pinaster, Ell. & Sol.**

**Trophosome.** Hydrocaulus simple, branches alternating in one plane; the chief stem and branches are of about equal thickness. Hydrothecæ tubular, placed opposite one another, diverge greatly distally, have a smooth, circular opening.

**Gonosome.** Oviform. *Male*: with 4 spikes at the distal end; *female*: with 4 ribs, each bearing two spines near the distal end. The gonangia of both sexes have tubular openings.

A small (about 5 cm. high) colony of this species was brought from the N. Atlan. Exp. The number of the station is obliterated.

#### **Thuiaria filicula, Ell. & Sol.**

**Trophosome.** Hydrocaulus simple, ramification alternating in one plane. Main stem zigzagged, a branch starting from every angle. Hydrothecæ bottle-shaped, placed opposite one another, diverging distally; the opening is smooth, circular, and its plane is perpendicular to the axis of the branch.

**Gonosome.** Gonangia pear-shaped, with a tubular opening.

Of this species also, only one small colony was found, about 4 cm. high, and slightly ramified.

**Locality.** Station 262.

#### **Thuiaria articulata, Pal.**

**Trophosome.** Hydrocaulus simple, ramification alternating in one plane. Hydrothecæ bottle-shaped, placed alternately and completely imbedded in the branch, with circular opening.

**Gonosome.** Gonangia pear-shaped, with round opening, which closes with a lid.

Two or three colonies, 7—10 cm. high, were found with *Lafoëa gracillima*.

**Locality.** Stations 267.

#### **Thuiaria argentea, Ell. & Sol.**

**Trophosome.** Hydrocaulus simple, ramification in one plane; main stem zigzagged, with branches starting from every angle. Hydrothecæ bottle-shaped, placed alternately; the opening, which has a pointed tooth on its margin, is directed outwards.

**Gonosome.** Gonangia pear-shaped, with one or two spikes at the distal end, and a tubular opening.

**Locality.** Unknown.

Fam. Sertularidae.

	Hydrotheker	Arter	Hydrocaulus	Hydrotheker	Gonangier	Findested	
						Norge	Nordh.- Dybde Exp.
Gruppe IV. <b>Selaginopsis.</b> Hydrotheker i flere Rækker rundt Stammen.	Divergerende	Bilateral An- ordning: men Hydrothekerne afvexlende rettet til modsat Side. (Overgang til 4-rækket Anordning)	<b>S. fusca</b> , Johnston, 57, 82.	Hoved- stammen tyk med Hydro- theker. Ikke bøiet	(Glat Rand	Boian	— ?
	Indleiret i Stammen			Forgrening i et Plan			
		6 Længde- rækker. Alter- nerende stillet	<b>S. mirabilis</b> , Verrill, 119, 85.	En spids Tand paa hver Side	Findes i Rækker paa Hydro- cladernes Overside	Tromsø	— ?
			<b>S. obsoleta</b> , Lepech. 71.	Zikzak- bøiet. Delt i ulige lange Led		—	St. 322 38 m.
Gruppe V. <b>Hydrallmania.</b> Unilateral Anordning af Hydrotheker.	Divergerende	4 Længderækker. Enkelte Grene bare to	<b>S. arctica</b> , n. sp.	(a. 70 mm. høi	(Glat Rand	—	St. 322 38 m.
		Unilateral. Hydrothekerne afvexlende rettet til modsat Side	<b>H. falcata</b> , Lin. 57.	Spiralsnoet Hoved- stammen ingen Hy- drotheker. Grene fjer- formede	Flasketformig	Bergen Lofoten	Station 200—2000 m. St. 325
					Svagt bøjet Kant	Rund Aabning	
					Ovale		

Fam. Sertularidae.

	Hydrothecae	Species	Hydrocaulus	Hydrothecae	Gonangia	Where found			
						Norway	N. Atl. Exp.	Depth m.	
Group IV. <b>Selaginopsis.</b> Hydrothecae in several rows round the stem.	Divergent	Bilateral arrangement, but hydrothecae alternately turned to opposite sides. (Transition to 1 row)	<b>S. fusca</b> , Johnston. 57, 82.	Main stem thick with hydrothecae. Not curved	Smooth margin	Pear-shaped. (Young stages conical)	Bergen — ?		
		6 longitudinal rows. Placed alternately	<b>S. mirabilis</b> , Verrill. 119, 85.	Tapers towards the distal end					Opening oval. Greatest diameter at right angles to the length of the branch
	Imbedded in the stem	Main stem none	<b>S. obsoleta</b> , Lepech. 71.		Zag-zagged. Divided into unequal joints	Smooth margin	Conical; attached by the apex	Station 322	38
		4 longitudinal rows. A few branches only two	<b>S. arctica</b> , n. sp.	About 70 mm. high					
Group V. <b>Hydrallmania.</b> Unilateral arrangement of hydrothecae.	Divergent	Unilateral. Hydrothecae turned alternately to opposite sides	<b>H. falcata</b> , Lin. 57.	Main stem in hydrothecae. Branches spiral	Bottle-shaped	Oval	Round opening	Bergen to Lofoten	Stations 200-2000 303, 325



**Selaginopsis obsoleta**, Lepechin.

(Tab. VI, Fig. 3).

**Trophosome.** Hydrocaulus enkel, Forgrening alternerende i et Plan; Hovedstammen zikzakbøiet, uden Hydrotheker og tydelig delt i ulige lange Led. Hydrotheker indleiret i Stammen, ca. 6 i hver Kreds. Kredsene er tæt stillet over hinanden, og saaledes at hver Hydrothek i en Kreds staar vertikalt over et Mellemrum i den nedenfor liggende. Hydrothekerne smalner af mod Aabningen, der er oval og med glat Rand.

**Gonosome.** Gonangier omvendt kegleformige, findes spredt over Grenene, men mest paa den Side af dem, der vender mod Koloniens distale Ende.

En Del Kolonier af *Selaginopsis*, som fandtes under Nordh.-Exp. maa nærmest henfores til ovennævnte Art, der findes omtalt af *Kirchenpauer* (71)\*.

Kolonien er ca. 20 cm. høj og har Form som et høit Triangel. Som Fig. 3 viser, kan man tydelig følge Koloniens Væxt (sandsynligvis Aarstilvæxt), idet det oprindelige Triangels Flade er forøget ved at nye Lag er tilføjet paa dets Sider. Hvis hvert af disse Lag repræsenterer et Aars Tilvæxt, kan man paa en Koloni af denne Art uden Vanskelighed læse dens Alder. Nærværende Exemplar havde isaafald begyndt sin tredje Sommer, og den lille Sidegren skød ud i Løbet af Koloniens andet Aar.

Gonangierne, der er smaa i Forhold til Hydrothekernes Størrelse, staar ikke omtalt i *Kirchenpauers* Beskrivelse af Arten. De er kegleformige, fæstet til Grenene med sin Spids og ret afskaarne i den distale Ende.

**Findested.** St. 322.

**Selaginopsis arctica**, n. sp.

(Tab. VI, Fig. 4).

**Trophosome.** Hydrocaulus enkel, svagt bøiet og delt i ulige lange Led; Forgrening fjærformig i et Plan. Saavel Stamme som Grene bærer Hydrotheker i 4 Længderækker (enkelte Grene bare to). Hydrothekerne er indleiret i Stammen, smalner af mod den distale Ende og har oval Aabning med glat Rand.

**Gonosome.** Gonangier staar i tætte Rækker paa Grenenes Overside og er lidt længere end Mellemrummet mellem to Grene. De er kegleformige, fæstet med Spidsen og har et ydre Marsupium.

Denne Art er mindre end den foregaaende, og den er let kjendelig ved de 4 regelmæssige Længderækker, der dannes af helt indleirede Hydrotheker. Grenene, der udgaar alternerende fra Hovedstammen, er ofte selv dichotomisk delte i Spidsen.

\* Jeg har desværre ikke havt Anledning til at se *Lepechin's* egen Beskrivelse af Arten.

**Selaginopsis obsoleta**, Lepechin.

(Pl. VI, fig. 3).

**Trophosome.** Hydrocaulus simple, ramification alternating in one plane; main stem zigzagged, without hydrothecæ, and distinctly divided into unequal joints. Hydrothecæ imbedded in the stem, about 6 in every circle; the circles are close together, one above another, and in such a manner that each hydrotheca in a circle is vertically over an interspace in the circle below. The hydrothecæ taper towards the opening, which is oval and has a smooth margin.

**Gonosome.** Gonangia of an inverted conical form, scattered over the branches, but chiefly on the side which is turned towards the distal end of the colony.

Some of the colonies of *Selaginopsis* that were found in the N. Atlan. Exp. must be referred to the above species, which is mentioned by *Kirchenpauer* (71)\*.

The colony is about 20 cm. in height, and has the form of a high triangle. As shown in fig. 3 the growth of the colony can be distinctly followed (probably yearly growth) in the addition of new layers on the sides of the original triangle. If each of these layers represents a year's growth, the age of a colony of this species may be easily told. On a supposition of this kind, the present specimen had entered upon its third summer, and the little lateral branch grew out in the course of the colony's second year.

The gonangia, which are small in comparison to the hydrothecæ, are not mentioned in *Kirchenpauer's* description of the species. They are conical, attached to the branch by their apex, and abruptly truncated at the distal end.

**Locality.** Station 322.

**Selaginopsis arctica**, n. sp.

(Pl. VI, fig. 4).

**Trophosome.** Hydrocaulus simple, slightly curved, and divided into unequal joints; ramification spiral in one plane. Both stem and branches bear hydrothecæ, standing in 4 longitudinal rows (a few branches only 2). Hydrothecæ imbedded in the stem, taper towards the distal end, and have an oval opening with a smooth margin.

**Gonosome.** Gonangia stand in thick rows upon the upper side of the branches, and are a little longer than the space between two branches. They are conical, attached by the apex, and have an external marsupium.

The species is smaller than the preceding one, and is easily recognisable by the four regular longitudinal rows, formed of wholly imbedded hydrothecæ. The branches, which grow alternately from opposite sides of the main stem, are often dichotomous at the apex.

*Lepechin's* original description I have unfortunately not had an opportunity of seeing.

Et eiendommeligt Udseende har Kolonien i den Tid da Gonangierne er fuldt udviklede. Disse voxer i meget tætte Rækker langs Oversiden af Grenene og har alle sin Længderetning parallel Hovedstammens. Deres Længde er noget større end den vertikale Afstand mellem to Grene, og de forskellige Rækker af Gonangier kommer saaledes til at dække hinanden som Tågsten, idet hver Rækkes Gonangier med sin distale Del dækker den nærmest ovenfor liggende Gren og dermed ogsaa udspringet af dens Gonangierække.

Paa Nordh.-Exp.'s Exemplar er de fleste Gonangiers Indhold tømt ud i de ydre Marsupier, og disse fremhæver sig derfor som tætte Rader af smaa Kugler, der danner den ovre Begrænsning af hver enkelt Gonangierække.

**Findested.** St. 322.

#### **Hydrallmania falcata, Lin.**

**Trophosome.** Hydrocaulus tynd, bøielig, spiralsnoet, bærer ikke Hydrotheker; Grenene er ofte fjærformig forgrenede. Hydrotheker flaskeformige, unilateralt anordnet langs Grenene, men deres Munding er afvejlende rettet til høire og venstre. Deres Aabning er oval med svagt bugtet Kant.

**Gonosome.** Gonangier ovale, med rund Aabning.

Store Kolonier (15—20 cm.) af denne Art fandtes paa flere Stationer under Nordh.-Exp., men ikke alle Stationers Nummer findes bevaret.

**Findested.** St. 303 og 235.

#### **Fam. Plumularidae.**

*Hydranthes spindelformige med traadformige Tentakler i en Kreds. Hydrotheker siddende og anordnet i en Række langs Stamme og Grene. Hydrocaulus oftest med regelmæssig fjærformig Forgrening. Nematophorer altid tilstede.*

#### **Plumularia fragilis, Hamann.**

(Tab. VII, Fig. 1).

**Trophosome.** Kolonien fjærformig; Hydrocaulus enkel, tydelig leddet; hvert Led bærer 1 Hydrocladium. Disse udgaar alternerende, og hvertandet Internodium bærer en Hydrothek, hvis Længde er omtrent  $\frac{1}{3}$  af Internodiets. 1 Nematophor findes proximalt for hver Hydrothek, medens de mellemliggende Internodier er nøgne.

**Gonosome.** Gonangier ovale, næsten siddende, ofte med spidse Fremspring i distale Ende; de sidder i to Rækker langs Hovedstammen, lodret paa denne og i Hydrocladiernes Plan.

The colony has a very peculiar appearance when the gonangia are fully developed. The latter grow in very thick rows along the upper side of the branches, and all have their long axis parallel with that of the main stem. Their length is somewhat greater than the vertical distance between two branches, and the different rows of gonangia thus cover one another like roof slates, the distal portion of those in one row covering the next branch above them, and therefore also the base of its gonangia.

In the N. Atlan. Exp. specimens, most of the gonangia have emptied their contents into the external marsupia, which appear in consequence like close rows of little spheres, forming the upper border of each row of gonangia.

**Locality.** Station 322.

#### **Hydrallmania falcata, Lin.**

**Trophosome.** Hydrocaulus thin, flexible, spirally twisted, does not bear hydrothecæ; the branches are often pinnate. Hydrothecæ bottle-shaped, unilaterally arranged along the branches, but their opening is alternately to the right and left. The opening is oval, with slightly curving edge.

**Gonosome.** Gonangia oval, with round opening.

Large colonies (15—20 cm.) of this species were found at several stations during the N. Atlan. Exp., but not all the numbers of the stations have been preserved.

**Locality.** Stations 303 and 235.

#### **Fam. Plumularidae.**

*Hydranthes spindle-shaped, with filiform tentacles in a circle. Hydrothecæ sessile and arranged in a row along the stem and branches. Hydrocaulus generally with regular pinnate ramification. Nematophores always present.*

#### **Plumularia fragilis, Hamann.**

(Pl. VII, fig. 1).

**Trophosome.** Colony pinnate; hydrocaulus simple, distinctly articulated, each joint bearing 1 hydrocladium. These grow alternately from opposite sides, and every other internode bears 1 hydrotheca, whose length is about  $\frac{1}{3}$  that of the internode. One nematophore is found on the proximal side of each hydrotheca, while the intervening internodes are bare.

**Gonosome.** Gonangia oval, almost sessile, often with sharp projections at the distal end; they stand in 2 rows along the main stem, perpendicular to it, and in the plane of the hydrocladia.



Ham. Plumularidae.

Kolonien	Hydrocladier	Gonangier	Arter	Hydrocaulus	Hydrothek	Nematophorer	Gonangier	Findested
Gen. I. <b>Plumularia.</b> Kolonien fjerformige. Hydrotheker med glat Rand. Nematophorer spredt over Kolonien.		<i>a.</i> Iflere Rækker langs Hovedst. Desuden af og til paa Hydrocladierne	<b>P. pinnata</b> , Lin. 57.	Enkel	Langde ca. $\frac{1}{2}$ Internodium		<i>a.</i> Ovale, næsten sidstende; med spidse Paa Toppen	Krania-fjorden — Trondhjem-fjorden
		Hvert Internodium bærer 1 Hydrothek	<b>P. elegantula</b> , G. O. Sars. 97.		Paa distale Del af Internodiet $\frac{1}{8}$ — $\frac{1}{3}$ af Længde $\frac{1}{8}$ — $\frac{1}{3}$ af Internodiet	2 paa hvert Internodium, prox. og dist. for Hydrothekerne		Krania-fjorden —
		Som $\beta$	<b>P. rubra</b> , n. sp.		Paa prox. male Del af Internodiet		Staal kugl form. Spidsen ned. Samme Plan som Hydrocladierne	Trondhjem-fjorden
		Som $\alpha$	<b>P. fragilis</b> , Hamann. 50.		Langde $\frac{1}{2}$ Internodium	1 prox. for hver Hydrothek. Mellem ligg. Internodier nogle	Som $\alpha$ . Ledet paa Hydrocladier i samme Plan som Hydrocladierne	Trondhjem-fjorden St. 9, 10
		Hvert andet Internodium bærer 1 Hydrothek	<b>P. setacea</b> , Ellis. 57.	Sammenhængende	Langde $\frac{1}{2}$ Internodium		Flaskeformede	Krania-fjorden — Har-danger
		$\beta$ . Ved Basis af Hydrocladierne eller deres Forgreninger	<b>P. gracillima</b> , G. O. Sars. 97.		Langde $\frac{1}{2}$ Internodium	1 omgiver hver Hydrothek (1 proximal og 1 Par distal). Ellers findes de spredt over Hydrocladierne	Bægerform. Ret afskaaret, cirkelformig Aabning	Stavanger Lobben
		Ukjendt	<b>P. variabilis</b> , n. sp.		Langde $\frac{1}{2}$ Internodium		Ukjendt	St. 290
		Paa Hydrocladier, ved Basis af Hydrothekerne	<b>P. frutescens</b> , Ell. & Sol. 57.		Forskj. Antal cylindriske Hydrotheker paa hvert Internodium		Parform. Stor Aabning lukket med Laag	Stavanger Trondhjem-fjorden
		Hvert andet Internodium bærer 1 Hydrothek	<b>P. catharina</b> , Johnst. 57.	Enkel	Ikke alle Led bærer Hydrocladier	Store, kopformede; divergerende fra Hydrocladierne	<i>Han:</i> Oval. <i>Han:</i> Parformig med Laag. To Nematoph. ved Basis. Tildækket Stuk.	St. 290
		Hvert Internodium bærer 1 Hydrothek	<b>P. flabellata</b> , G. O. Sars. 97.	Zammenhængende	Hvert Led bærer flere Hydrocladier		Ukjendt	Stavanger



	Colony	Hydrocladia	Gonangia	Species	Hydrocaulus	Hydrotheae	Nematophores	Gonangia	Where found
Gen. I. <b>Plumularia.</b> Colony pinnate. Hydrothecae with smooth margin. Nematophores scattered over the colony.	Simple pinnate, or irregular ramification	Unramified	a. In several rows along the main stem. (Also occasionally on the hydrocladia)	<b>P. pinnata</b> , Lin. 57.	Simple	Length about 1/3 an internode	2 on each internode; proximal and distal as regards hydrothecae	a. Oval, almost sessile; with pointed projections at the top	Kristiania Fjord to Trondhj. Fjord
				<b>P. elegantula</b> , G. O. Sars, 97.		On distal part of internode Length 1/8—1/2 that of internode			
				<b>P. rubra</b> , n. sp.		On proximal part of internode			
				<b>P. fragilis</b> , Hamann, 50.		Length 1/2 that of internode			
				<b>P. setacea</b> , Ellis, 57.		Length 1/2 that of internode			
				<b>P. gracillima</b> , G. O. Sars, 97.		Length 1/2 that of internode			
				<b>P. variabilis</b> , n. sp.		Length 1/2 that of internode			
				<b>P. frutescens</b> , Ell. & Sol. 57.		Different number of ex-hydrocladia on each internode			
				<b>P. catharina</b> , Johnston, 57.		Large, cup-shaped; diverging from hydrocladia			
				<b>P. flabellata</b> , G. O. Sars, 97.		Each joint bears several hydrocladia			
	Compound, pinnate	Unramified	b. At the base of the hydrocladia or their ramifications	Every other internode bears 1 hydrothea	Compound	1 on proximal side of each hydrothea. Intervening internodes bare	1 on proximal side of each hydrothea. Intervening internodes bare	Like <i>a</i> ; on hydrocaulus in same plane as hydrocladia	Station 267
	Alternating	Opposite	On the hydrocladia, at the base of the hydrothecae	Every other internode bears 1 hydrothea	Compound	1 on proximal side of each hydrothea. Intervening internodes bare	1 on proximal side of each hydrothea. Intervening internodes bare	Like <i>a</i> ; on hydrocaulus in same plane as hydrocladia	Station 267
	Compound, pinnate	Unramified	c. At the base of the hydrocladia or their ramifications	Every other internode bears 1 hydrothea	Compound	1 on proximal side of each hydrothea. Intervening internodes bare	1 on proximal side of each hydrothea. Intervening internodes bare	Like <i>a</i> ; on hydrocaulus in same plane as hydrocladia	Station 267

Denne Art, af hvilken et Par Kolonier (ca. 5 cm. høje) blev fundet paa en af Nordh.-Exp.'s Stationer, er særdeles fint bygget, og saa hyalin, at det vilde være vanskeligt at faa Øie paa den, hvis den var uden Gonoforer. Koloniens Form ligner *P. pinnata*, kun staar Hydrocladierne ikke saa tæt som hos denne, (paa et Par af de Kolonier, jeg havde til Undersøgelse fandtes Hydrocladier kun i den distale Del), og den adskilles let fra *P. pinnata*, saavel ved den finere Bygning, som ogsaa derved, at kun hvert andet Internodium bærer Hydrotheker. Gonangiernes Stilling er ogsaa forskjellig hos de to Arter, idet deres Plan hos *P. fragilis* falder sammen med Hydrocladiernes, medens det hos *P. pinnata* er omtrent lodret paa samme.

**Findested.** St. 267.

### *Plumularia variabilis*, n. sp.

(Tab. VII, Fig. 3).

**Trophosome.** Kolonien fjærformig, udgaar fra en forgrenet Hydrorhiza; Hydrocaulus sammensat, tydelig delt i korte Internodier, der hvert bærer, paa alternerende Sider, en Hydrothek, en Gren (Hydrocladium) og to Nematophorer. Hydrocladierne er forgrenede, idet en Sidegren udgaar ikke langt fra deres Basis. De er delt i ulige lange Internodier, af hvilke 0—4 kan findes mellem hvert hydrothek-bærende Led. Af Nematophorer findes, foruden de omtalte paa Stammen, ogsaa tre paa hvert Hydrothek-bærende Internodium (1 proximalt og 1 Par distalt for hver Hydrothek), og desuden findes de spredt over Kolonien.

**Gonosome.** Ukjendt.

Denne Art har stor Lighed med *P. gracillima*, G. O. Sars, med Hensyn paa den ydre Form, paa Hydrocladiernes Forgrening og paa Nematophorerne Anordning omkring Hydrothekerne; men den skiller sig afgjort fra nævnte Art ved sin forgrenede Hydrorhiza og specielt derved, at Hydrocladiernes Internodier varierer i Længde og Anordning, medens deres Bygning hos de øvrige af Slægtens Arter synes at være ganske bestemt og karakteristisk for hver enkelt Art. Hoiden af de fundne Kolonier er 3—4 cm.

**Findested.** St. 290.

### *Plumularia rubra*, n. sp.

(Tab. VII, fig. 2.)

**Trophosome.** Kolonien fjærformet; Hydrocaulus enkel, delt i lige lange Internodier, der hvert bærer 1 Hydrocladium nær sin distale Ende. Hydrocladier ugrene, udgaar alternerende, fint bygget med lange Internodier, der hvert bærer 1 Hydrothek paa sin proximale Halvdel. Hydrothekernes Længde er  $\frac{1}{8}$ — $\frac{1}{3}$  af Internodiets. Nematophorer findes to paa hvert Internodium, en proximalt og en distalt for hver Hydrothek, og desuden som Regel en paa hvert af Stammens Internodier, lige ved

This species, of which two or three colonies were found at one of the N. Atlan. Exp. stations, is particularly delicate in structure, and so hyaline, that it would be difficult to discern, if it were not for the gonophores. In form, the colony resembles *P. pinnata*, except that the hydrocladia do not stand so close as in that species (in one or two of the colonies I examined, there were hydrocladia only on the distal portion), and it is easily distinguishable from that species both by its more delicate structure, and by the fact that every other internode bears hydrothecæ. The position of the gonangia too, is different in the two species, their plane in *P. fragilis* being identical with that of the hydrocladia, while in *P. pinnata* it is almost perpendicular to it.

**Locality.** Station 267.

### *Plumularia variabilis*, n. sp.

(Pl. VII, fig. 3).

**Trophosome.** Colony pinnate, issuing from a branching hydrorhiza; hydrocaulus compound, distinctly divided into short internodes, each bearing, on alternate sides, one hydrotheca, one hydrocladium and two nematophores. The hydrocladia are ramified, a lateral branch issuing not far from their base. They are divided into unequal internodes, of which from 0 to 4 may be found between every two hydrotheca-bearing joints. Besides the above-mentioned nematophores on the stem, there are also three on each hydrotheca-bearing internode (1 proximal, and one pair distal for every hydrotheca), and moreover scattered over the colony.

**Gonosome.** Unknown.

This species bears a great resemblance to *P. gracillima*, G. O. Sars, as far as the external form, the branching of the hydrocladia, and arrangement of the nematophores round the hydrothecæ are concerned, but it differs decidedly from the above-named species in its branching hydrorhiza, and still more in the varying length and arrangement of the internodes of the hydrocladia, while their structure in the rest of the species of the genus seems to be quite decided and characteristic of each species. The height of the colonies found is from 3 to 4 cm.

**Locality.** Station 290.

### *Plumularia rubra*, n. sp.

(Pl. VII, fig. 2).

**Trophosome.** Colony pinnate; hydrocaulus simple, divided into equal internodes, each bearing 1 hydrocladium near its distal end. Hydrocladia unramified, branching out alternately, of delicate structure with long internodes, each bearing 1 hydrotheca on its proximal half. The length of the hydrotheca is  $\frac{1}{8}$  to  $\frac{1}{3}$  that of the internode. There are two nematophores on each internode, one proximal and one distal in relation to each hydrotheca, and also as a rule, one on each internode of the stem, close

Fam. Plumularidae.

	Gonangiermes Stilling	Hydrothekranden	Arter	Hydrocaulus	Hydrocladier	Hydrotheker	Nematophor	Phylactocarper	Gonangier	Findested
Gen. II. <b>Aglaophenia.</b> Kolonien fjærformig. Hydrothekernes Rand oftest tundet. Nematophorer kun omkring Hydrothekerne	Langes hydrocaulus	Glat	<b>A. integra,</b> G. O. Sars, 97.	Sammensat i den nedre Del. Ugrenet, eller svagt og uregelmæssig forgrenet	Hydrocladier. Hvert Internodium bærer en Hydrothek.  3 omgiver hver Hydrothek, 1 proximal, der omfatter deres nederste Del, og et Par laterale ved Hydrothekernes Munding, der ræger noget frem over denne			Ikke tilstede	a. Bz-formig; oval Aabin, skjævt be- liggende i distale Ende	N Exp. — Dybd.
			<b>A. pourtalesii,</b> Verrill, 118.							
	Paa særskilte Smaagrener, der udgaar fra Hydrocaulus ( <i>Phylactocarper</i> )	To spidse Tænder foran, ellers glat	<b>A. bicuspis,</b> G. O. Sars, 97.	Sammensat; oftest ugrenet; ud- gaar fra en Hydrophiza, dannet af fint for- grenede Rør	Sammentrykt fra Siderne; med et skarpt, kylformet Fremspring foran	Sammentrykt fra Siderne	Flere Gange dichotomt delt; boiet ind over Gonangierne, der sidder ved deres Basis	Ugrenet; med utydelig Leddeling; 1 Nematophor ved Basis af hvert Gonangium	Pæreformet; Aabningen halmmaane- formet med største Kurve distal	120—140 m.
		En stor spids Tand foran, og to ganske smaa paa hver Side	<b>A. compressa,</b> n. sp.							
		Regelmæssig tandet	<b>A. formosa,</b> Allm. 15, 19 1.							
Fæstet til omdannede Hydrocladier. ( <i>Corbula</i> )	Svagt bngtet, med en bredt afskaaen Tand midt foran	<b>A. myriophyllum,</b> Linn. 57, 97, 69.	Cylindrisk	Kegleformig, Cirkelrund Aabning i den distale Ende	Oval, tilspidset i begge Endes finer	1 eller flere Hydrocladier omdannet til <i>Corbula</i> , i hvis Indre Gonangier findes	—	St. 357 313 m.	—	—



Fam. Plumularidae.

	Gonangia	Hydrotheca margin	Species	Hydrocaulus	Hydrocladia	Hydrothecae	Nematophores	Phylactocarps	Gonangia	Where found
<p>Gen. II.</p> <p><b>Aglaophenia.</b></p> <p>Colony pinnate.</p> <p>Hydrotheca-margin generally dentated.</p> <p>Nematophores only round hydrothecae.</p>	Along the hydrocaulus		<b>A. integra,</b> (i. O. Sars, 97.		<p>Alternating. Each internode bears a hydrotheca</p>	Cylindrical; somewhat expanded towards the opening	<p>3 round each hydrotheca. 1 proximal enclosing the lower part, and a pair of lateral at the opening of the hydrotheca, projecting a little beyond it</p>	Wanting	o. Ovoid; oval opening, lying obliquely at the distal end	Stavanger to Bodo
		Smooth	<b>A. pourtalesii,</b> Verrill, 118.	Compound in the lower part, branched or slightly and irregularly ramified					Pear-shaped; opening crescent-shaped, with greatest curve distally	Espevær, Skarnsund
	On separate branchlets, growing from the hydrocaulus ( <i>Phylactocarps</i> )	Two pointed teeth in front; smooth elsewhere	<b>A. bicuspis,</b> (i. O. Sars, 97.			Compressed from the sides		Divided several times dichotomously; curved over the gonangia at their base		Trendhøi, Fjorð to Stavanger
		One large, pointed tooth in front and two quite small ones on each side	<b>A. compressa,</b> n. sp.			Compressed from the sides with a sharp, keel-like projection in front		First 3 or 4 joints, which only bear nemata; then dichotomous division in two hydrotheca-bearing branches; gonangia in angles	Lake o	St. 113 370
		Regularly dentated	<b>A. formosa,</b> Allm, 15, 194.	Compound, generally unramified; issuing from a hydrocladus formed of finely ramified branches				Ramified in one plane; gonangia in the angles	Conical; circular opening at the distal end	St. 554 330
	Attached to transformed hydrocladia ( <i>Corbula</i> )	Slightly undulating, with a broadly truncated tooth in the middle in front	<b>A. myriophyllum,</b> Lin. 57, 97, 69.			Cylindrical		1 or more hydrocladia transformed to <i>corbula</i> , inside which are gonangia	Oval, pointed at both ends	West coast St. 110, 18 750

deres proximale Ende og vendende mod nærmeste Hydrocladium.

**Gonosome.** Gonangier smalt kegleformige, fæstet med Spidsen til Basis af Hydrocladierne, i hvis Plan de ligger.

Af denne Art fandtes paa Nordh.-Exp. kun to ganske smaa Kolonier uden Gonangier, og Beskrivelsen er derfor væsentlig taget fra en Koloni af samme Art, der er fundet ved Rødbjerget i Trondhjemsfjorden, men ikke tidligere undersøgt. Arten er nærmest beslægtet med *P. elegantula*, men skiller sig fra denne ved Hydrothekernes Plads paa Internodiernes proximale Del, og væsentlig ved Gonangiernes Form og deres Stilling i Vinklerne ved Hydrocladiernes Udgangspunkt, istedetfor i Rækker langs Hovedstammen. Hele Kolonien, men især Gonangierne har en vakker rød Farve, og den overgaar i Elegance næsten alle sine Slægtninge. Høide 2—5 cm.

**Findested.** St. 9 og 10.

#### ***Aglaophenia compressa*, n. sp.**

(Tab. VII, Fig. 4).

**Trophosome.** Kolonien enkel fjærformet; Hydrocaulus sammensat i den nedre Del, regelmæssig leddet. Hvert Internodium bærer en Gren og to Nematophorer ved dennes Basis. Hydrotheker store, sammentrykte fra Siderne, har foran et skarpt kjølformet Fremspring, der oventil løber ud i en lang, spids Tand. Ved Basis af denne sees paa hver Side en ganske liden Udbugtning af Hydrothekranden og ligesaa to smaa Tænder paa hver Side inde mod Hydrocladiet. Laterale Nematophorer svagt udadrettede, rager noget frem over Hydrothekernes Rand; den mediane naar omtrent til Halvdelen af Hydrothekernes Høide.

**Gonosome.** Gonangier ægformige, med en oval Aabning skjævt beliggende i distale Ende. De sidder ved en kort Stilk fæstet ved Basis af Hydrocladiernes første Hydrothek, eller de bæres af særskilte Smaagrener, der udgaar fra samme Sted.

Denne Art har nogen Lighed med *A. cornutus*, Verrill, idet begge har sammentrykte Hydrotheker og et kjølformet Fremspring paa disse, ligesom Gonangierne og deres Stilling i Kolonien er meget lignende. Men ved at sammenligne mine Afbildninger med *Lervinsens* (62) Illustrationer til nævnte Art, ser man dog en paafaldende Forskjel i Hydrothekernes Bygning. Medens de hos *A. cornutus* smalner sterkt af mod Bunden, „somewhat triangular or obconic in a side view“ (Verrill [118]), har de hos denne nye Art omtrent samme Bredde helt ned og er, set fra Siden, tilnærmelsesvis kvadratiske; desuden er Hydrothekranden hos *A. cornutus* overalt opdelt i triangelformige Tænder, medens den her paa længere Stykker er glat.

to their proximal end, and turned towards the nearest hydrocladium.

**Gonosome.** Gonangia narrow conical, attached by the apex to the base of the hydrocladia, in whose plane they lie.

Only two very small colonies of this species without gonangia were found on the N. Atlan. Exp., and the description is therefore taken chiefly from a colony of the same species, which was found off Rødbjerget in the Trondhjem Fjord, but has not previously been examined. The species is nearly allied to *P. elegantula*, but differs from it in the hydrothecæ's place on the proximal part of the internodes and essentially in the form of the gonangia, and their position in the angles by the base of the hydrocladia, instead of in rows along the main stem. The whole colony, and especially the gonangia, have a beautiful red colour, and in elegance it surpasses almost all its relations. Height 2—5 cm.

**Locality.** Stations 9 and 10.

#### ***Aglaophenia compressa*, n. sp.**

(Pl. VII, fig. 4).

**Trophosome.** Colony simple pinnate; hydrocaulus compound in the lower portion, and regularly articulated. Every internode bears a hydrocladium, and two nematophores at the base of the hydrocladium. Hydrothecæ large, laterally compressed, have in front a sharply carinated projection which runs out above in a long, pointed tooth. At its base on each side there is a very small swelling of the hydrotheca-margin, and also two small denticles on each side, in towards the hydrocladium. Lateral nematophores pointing slightly outwards, projecting a little beyond the margin of the hydrothecæ, and the median one reaching to about half the height of the hydrothecæ.

**Gonosome.** Gonangia oviform, with an oval opening lying obliquely at the distal end. They are on a short stalk attached at the base of the hydrocladium's first hydrotheca, or are borne on separate branchlets, growing out from the same spot.

This species has some resemblance to *A. cornutus*, Verrill, both having compressed hydrothecæ, and a carinated projection on them, the gonangia and their position in the colony being also very similar. But on comparing my drawings with *Lervinsen's* (62) illustrations of the above-named species, a striking difference in the structure of the hydrothecæ is apparent. Whereas in *A. cornutus*, they taper rapidly towards the bottom, are „somewhat triangular or obconic in a side view“ (Verrill [118]), in this new species their breadth is about the same all the way down, and in a side view they are approximately quadrilateral; moreover, the margin of the hydrothecæ in *A. cornutus* is always cut up into triangular denticles, while here long portions of it are smooth.

Gonangierne udgaar, som ovenfor nævnt, enten fra Hydrocladiernes første Led ved Basis af dettes Hydrothek, der ligesom de øvrige Hydrotheker er omgivet af tre Nematophorer, eller fra særskilte Grene, der udgaar fra samme Sted. Disse Grene er af omtrent samme Længde som Hydrocladierne; de er meget iøjensfaldende, da deres Retning er en anden end Hydrocladiernes, idet de danner en næsten ret Vinkel med Hovedstammens Længderetning. De har som Regel først endel Internodier, der kun bærer Nematophorer, og i deres distale Del udsendes et Par alterneret stillede, korte Grene, der bærer Hydrotheker af samme Bygning som de almindelige Hydrocladiers. Ved Basis af første Hydrothek paa disse smaa Grene findes da Gonangierne fæstet ved en kort Stilk, med 2—3 Ringe.

**Findested.** St. 313.

### *Aglaophenia formosa*, Allm.\*

**Trophosome.** Kolonien fjærformet, oftest ugrenet; Hydrocaulus sammensat, udgaar fra en Hydrorhiza, dannet af fint forgrenede Rør. Hydrocladier alternerende. Hydrotheker næsten cylindriske, regelmæssig tandede i Kanten. Laterale Nematophorer rager neppe over Hydrothekernes Rand, mediane naar til ca.  $\frac{1}{3}$  af deres Hoide; den sidste er ved et Septum delt i en proximal og en distal Del.

**Gonosome.** Gonangier kegleformige med cirkelrund Aabning i distale Ende, bæres i Vinklerne af dichotomisk forgrenede Phylactocarper, der udgaar fra Basis af Hydrocladiernes første Hydrothek, som mangler median Nematophor.

Denne Art, som efter *Allmans* Beskrivelse kan naa en Hoide af 10 cm., er i Nordh.-Exp.'s Materiale repræsenteret ved et lidet Exemplar, 3—4 cm. høit. Den er let at kjende paa de ensartede Tænder, der findes langs hele Hydrothekranden, og ligesaa ved de dichotomisk forgrenede Phylactocarper, der — i Modsætning til de samme hos *A. compressa* — danner en Vinkel med Hovedstammen, der er mindre end Hydrocladiernes.

**Findested.** St. 357.

### *Aglaophenia myriophyllum*, Lin.

**Trophosome.** Kolonien fjærformet, oftest ugrenet; Hydrocaulus sammensat, udgaar fra en Hydrorhiza, dannet af fint forgrenede Tuber, bærer alternerende Hydrocladier. Hydrotheker cylindriske; deres Kant er svagt bugtet og har midt foran en bredt afskaaren Tand. Laterale Nematophorer rækker lidt ovenfor Hydrothekernes Rand, mediane ikke fuldt til deres halve Hoide.

The gonangia, as mentioned above, issue either from the first joint of the hydrocladium, at the base of its hydrotheca, which, like the other hydrothecæ, is surrounded by three nematophores, or from separate branches, issuing from the same spot. These branches are of about the same length as the hydrocladia, and are very conspicuous, owing to the fact that they grow in a different direction to that of the hydrocladia, and are at almost right angles to the longitudinal direction of the main stem. They have first, as a rule, some internodes which only bear nematophores, and on their distal part grow a pair of alternately placed short branches, bearing hydrothecæ of the same structure as those of the ordinary hydrocladia. At the base of the first hydrotheca on these small branches, the gonangia are found attached by a short stalk with 2 or 3 rings.

**Locality.** Station 313.

### *Aglaophenia formosa*, Allm.\*

**Trophosome.** Colony pinnate, generally unramified, hydrocaulus compound, growing from a hydrorhiza formed of finely ramified tubes. Hydrocladia alternating. Hydrothecæ almost cylindrical, regularly dentated round the margin. Lateral nematophores scarcely project beyond the margin of the hydrothecæ, median attaining about  $\frac{1}{3}$  their height; the last is divided by a septum into a proximal and a distal part.

**Gonosome.** Gonangia conical, with circular opening at the distal end, stand in the angles of dichotomously ramified phylactocarps, issuing from the base of the hydrocladia's first hydrotheca, which has no median nematophore.

This species, which, according to *Allman*, may attain a height of 10 cm., is represented in the N. Atlan. Exp. collection by a small specimen, between 3 and 4 cm. high. It is easily recognisable by the uniform denticles that are found all along the margin of the hydrotheca, and also by the dichotomously branched phylactocarps, which, unlike those in *A. compressa*, make an angle with the main stem, which is less than that of the hydrocladia.

**Locality.** Station 357.

### *Aglaophenia myriophyllum*, Lin

**Trophosome.** Colony pinnate, generally unbranched; hydrocaulus compound, growing out of a hydrorhiza, formed of finely ramified tubes, and bearing alternating hydrocladia. Hydrothecæ cylindrical, their edge is slightly curved, and has a broadly truncated denticle in the middle of the front. Lateral nematophores reach a little beyond the edge of the hydrothecæ, the median ones not quite to half their height.

\* Illustrationerne til denne Art er ved en Feiltagelse trykt under Afhandlingen „Neue norwegische Hydroiden“ i Bergens Mus. Aarb. 1898.

\* The drawings of this species have, by an error, been printed in the paper, „Neue norwegische Hydroiden“ in the Year-book of the Bergen Museum, 1898.



Fam. Plumularidae.

	Hydrocladier		Arter	Hydrocaulus	Hydrotheker	Nematophorer	Gonangier		Findested	
							Stilling	Form	Norge	Nordh. Exp. Dyle
Gen. III. <b>Antennularia.</b> Hydrocladier udgaar til alle Sider. (Forøvrig som Plumularia).	Krans- stillede	Hvert Internodium bærer 1 Hydrothek	<b>A. norvegica,</b> G. O. Sars. 97.	Ulige Lange Led	Længde 1 1/2 Internodets. Paa dettes proximale Del	3 pr. Internod. i 1 en Række langs Multituben. aldre parret	Ved Basis af Hydro- cladierne	Form som et Horn, der med Spidsen er fæstet til Fremspring paa Hydroclad.,	Kranie- fjorden Har- 10, 15, 49 m.	200-350 m.
	Spredt rundt Stammen	Hvert andet Internodium 1 Hydrothek	<b>A. antennina,</b> Lin. 57.	Korte Led; hver med en Krans af Hydro- cladier	Længde ca. 1 1/2 Internodets	1 omk., hvort Hydrothek, (1 prox. og 1 Par- dist.) 1 paa hvert mellemliggende Internod.	Oval med skjaevt beliggende Åbning i distale Ende	Stavanger Fin- marken	200-400 m.	

Fam. Plumularidae.

	Hydrocladia		Species	Hydrocaulus	Hydrothecæ	Nematophores	Gonangia		Where found	
							Position	Form	Norway	N. Atl. Exp. Depth m.
Gen. III. <b>Antennularia.</b> Hydrocladia branch out on all sides (In other respects, like Plumularia).	In wreaths	Each internode bears 1 hydrotheca	<b>A. norvegica,</b> G. O. Sars. 97.	Unequal joints	Length 1 1/2, that of internode. On its proximal part	3 prs. internodes in a row along median line; never in pairs	At base of hydro- cladium	Like a horn, attached by point to projection on hydrocladium	Kristiania Fjord to Har- 10, 18, 79 danger Fjord	250-750
	Scattered round the stem	Every other internodium bears 1 hydrotheca	<b>A. antennina,</b> Lin. 57.	Short joints, each with a wreath of hydro- cladia	Length about 1 1/2; that of internode	3 round each hydrotheca (1 proximal and 1 pair distal), 1 on each inter- vening internode		Oval, with oblique opening at distal end	Stavanger to Fin- marken	200-400

**Gonosome.** Gonangier ovale, noget tilspidsede i begge Ender, bæres af en eller flere Hydrocladier, der er omdannede til Corbula.

Jeg kan ikke finde nogen Grund til at betragte *A. radicellata*, G. O. Sars, som en egen Art, forskjellig fra denne. Sars (97) siger selv i sin Beskrivelse af nævnte Art, at den ligner meget *A. myriophyllum*, men at den skiller sig fra den ved Hydrothekernes tydelig crenulerede Aabning, ved Koloniens Form og ringere Størrelse, og fremfor alt ved dens eiendommelige Befæstningsmaade, idet den har fint forgrenede Rodtrevler. Men naar man holder disse karakterer sammen med, hvad der staar om *A. myriophyllum*, Lin. i Hincks's Beskrivelse af denne Art (57) nemlig: „shoots . . . rising from a tuft of tangled fibres; hydrothecae . . . margin very slightly crenated“, saa blir der ikke andre Skillemerker igjen end en Gradsforskjel i Hydrothekrandens Bugtninger og i Koloniens Størrelse, og ingen af disse kan jeg betragte som karakteristiske Artsmerker.

**Findested.** St. 10 og 18.

#### **Antennularia norvegica, G. O. Sars.**

**Trophosome.** Hydrocaulus sammensat, delt i ulige lange Internodier. Hydrocladier ugrene; spredt rundt Stammen; hvert Internodium bærer paa sin proximale Del en Hydrothek; disse er smaa, ca.  $\frac{1}{8}$  af Internodiets Længde. Af Nematophorer findes tre paa hvert Internodium i en enkelt Række langs Midtlinien.

**Gonosome.** Gonangier har Form som Horn, og er med Spidsen fæstede til Fremspring paa Hydrocladiernes inderste Led. Den cirkelformige, distalt beliggende Aabning er lukket med et Laag.

Smaa Exemplarer af denne Art er under Nordh.-Exp. fundet paa tre Stationer udenfor Norges Kyst. Deres Hoide overgaar ikke 3 cm.

**Findested.** St. 10, 18 og 79.

#### **Meduser.**

Et Par Levninger af Meduser findes blandt Nordh.-Exp.'s Materiale, men da de er haardt medtagne efter Behandling med Spiritus i ca. 20 Aar, er det umuligt at gjøre nogen nærmere Undersøgelser over deres Anatomi og bestemme, hvilke Arter de repræsenterer.

Derimod har Prof. G. O. Sars under Expeditionen udført en Del Skizzer af Meduser, (Pl. VIII) efter hvilke man kan bestemme om ikke Arterne, saa dog ialfald de Familier hvortil Arterne horer\*.

\* Jeg finder det overflødig her at give nogen Beskrivelse af de fundne Meduser; denne maatte nemlig grundes udelukkende paa G. O. Sars's Tegninger, og da foretrækker jeg at lade disse tale for sig selv. Findesteder findes vedføjet Figurforklaringen.

**Gonosome.** Gonangia oval, somewhat pointed at both ends, carried by one or more hydrocladia transformed into corbula.

I can see no reason for regarding *A. radicellata*, G. O. Sars, as a peculiar species, different to the above. Sars himself, in his description of it (97), says that it greatly resembles *A. myriophyllum*, but that it differs in the distinctly crenulated opening, in the form and smaller size of the colony, and above all in its peculiar mode of attachment in having finely branching root-fibres. But when this is compared with what Hincks says in his description of *A. myriophyllum*, Lin. (57), namely: „shoots . . . rising from a tuft of tangled fibres; hydrothecae . . . margin very slightly crenated“, there is no distinguishing feature left but a difference in the degree of the curves in the margin of the hydrothecae, and in the size of the colony; and neither of these do I consider to be characteristic specific features.

**Locality.** Stations 10 and 18.

#### **Antennularia norvegica, G. O. Sars.**

**Trophosome.** Hydrocaulus compound, divided into unequal internodes. Hydrocladium unramified, scattered over the stem; each internode bears a hydrotheca on its proximal part; hydrothecae small, about  $\frac{1}{8}$  of the length of the internode. Nematophores three on each internode in a single row along the median line.

**Gonosome.** Gonangia in the form of a horn, and attached by the point to the projection upon the lowest joint of the hydrocladia. The distally situated, circular opening is closed with a lid.

Small specimens of this species were found during the N. Atlan. Exp. at three stations outside the Norwegian coast. Their height does not exceed 3 cm.

**Locality.** Stations 10, 18 and 79.

#### **Medusæ.**

There are a few fragments of medusæ in the N. Atlan. Exp. collection, but as they have suffered considerably after about 20 years treatment with spirit, it is impossible to make any detailed investigation of their anatomy, and determine the species which they represent.

On the other hand, Prof. G. O. Sars, during the expedition, made some sketches of medusæ (Pl. VIII), from which we may determine if not the species, at any rate the families to which the species belong\*.

\* I consider it superfluous to give here any description of the medusae found, as it would have to be based exclusively on G. O. Sars's drawings, and I prefer to let these speak for themselves. The places in which they were found are annexed to the description of the figures.

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..	5,	-	10	„	-	bottom:	gerera,	..	: genera
..	6,	-	1	„	-	top:	Cladocoryme,	„	: Cladocoryne
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„	22,	-	8	„	-	top:	this	„	: of this
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„	40,	-	9	„	-	top:	Boungainv.,	..	: Bougainv.



# Plate I.

## Tab. I.

- Fig. 1. *Hydractinia allmanii*, n. sp., nat. St. 1 *a*. Den samme, forstørret. 1 *b*. Tversnit gennem en Gonofor af samme.
- „ 2. *Hydractinia ornata*, n. sp., nat. St. 2 *a*. Den samme, forstørret.
- „ 3. *Hydractinia minuta*, n. sp., forstørret.
- „ 4. *Tubularia variabilis*, n. sp. 4 *a*. Gonoforer forstørrede, R = Ribber. 4 *b—d*. Snit gennem Gonoforer fra en og samme Blastostyl.
- „ 5. *Tubularia regalis*, Boeck, nat. St. (Tegnet af Prof. G. O. Sars under Expeditionen).
- „ 6. *Tubularia prolifer*, Agassiz, nat. St. 6 *a*. Hydranthen forstørret. 6 *b*. En Blastostyl. 6 *c*. Længdesnit. 6 *d*. Tversnit gennem en Gonofor. 6 *e*. Frit svømmende Meduse, forstørret. Rl = Meduseklokke, M = Manubrium, T = Tentakel, R = Knopper, Bl = Blastostyl, G = Generationsorgan.
- „ 7. *Corymorpha nana*, Alder, nat. St. 7 *a*. Blastostyl med unge Meduseknopper.

## Plate I.

- Fig. 1. *Hydractinia allmanii*, n. sp. nat. size. 1 *a*. The same, enlarged. 1 *b*. Cross section through a gonophore of the same sp.
- „ 2. *Hydractinia ornata*, n. sp., nat. size. 2 *a*. The same, enlarged.
- „ 3. *Hydractinia minuta*, n. sp., magnified.
- „ 4. *Tubularia variabilis*, n. sp. 4 *a*. Gonophores magnified; R = ribs. 4 *b—d*. Section through gonophores from one blastostyle.
- „ 5. *Tubularia regalis*, Boeck, nat. size. (Drawn by Prof. G. O. Sars during the expedition).
- „ 6. *Tubularia prolifer*, Agassiz; nat. size. 6 *a*. Hydranth magnified 6 *b*. A blastostyle. 6 *c*. Longitudinal section through a gonophore. 6 *d*. Transverse section through a gonophore. 6 *e*. Free-swimming medusa, magnified. Rl. = Medusa bell, M = Manubrium, T = Tentacle, R = Buds, Bl. = Blastostyle, G = Generative organs.
- „ 7. *Corymorpha nana*, Alder; nat. size. 7 *a*. Blastostyle with young medusa buds.



Fig. 1-4. et 6-7. Bonnevie del. Fig. 5. G.O. Sars del.





Plate II.

## Tab. II.

- Fig 1. *Tubularia?* *cornucopia*, n. sp., nat. St. (Tegnet af Prof. G. O. Sars under Exp.). 1 *a*. Blastostyl. 1 *b*. Snit gj. en Del af samme, Gon. = Gonofor-anlæg. 1 *c*. Øverste Parti af Hydrocaulus med Krave, Kr.
- „ 2. *Tubularia obliqua*, n. sp., nat. St. (Beskrivelse af Arten findes i: Zur Systematik der Hydroiden, 1898. Fig. er ved en Feiltagelse ikke trykt i samme Afhandling). 2 *a*. Blastostyl. 2 *b*. Snit gj. Parti af en Gonofor. T = Tentakel.
- „ 3. *Lampra sarsii*, n., noget forstørret. (Tegningerne er udført af G. O. Sars under Exp., ligesaa 3 *a*. Del af en Blastostyl). 3 *b*. Blastostyl. 3 *c*. Længde-snit gj. en Gonofor. T = Tentakel, O = Æg.
- „ 4. *Lampra atlantica*, n. sp. (Tegnet efter kontra-heret og noget medtaget Spiritusexemplar). 4 *a* og *b*. Snit gennem unge Gonoforanlæg, forat vise Udviklingen af de pseudomedusoide Gonoforer. 4 *c*. Tversnit gj. fuldt udviklet Gonofor. Ekt = Ektoderm. Ent = Entoderm.

## Plate II.

- Fig. 1. *Tubularia(?) cornucopia*, n. sp., nat. size. (Drawn by Prof. G. O. Sars during the expedition). 1 *a*. Blastostyle. 1 *b*. Section through a part of the same; Gon. = rudiment of gonophore. 1 *c*. Upper part of hydrocaulus with Kr = Collar.
- „ 2. *Tubularia obliqua*, n. sp., nat. size. (A description of the species is to be found in „Zur Systematik der Hydroiden, 1898. The figures, through an error, are not printed in the same paper). 2 *a*. Blastostyle. 2 *b*. Section through part of a gonophore. T = Tentacle.
- „ 3. *Lampra sarsii*, n. sp., somewhat magnified. (The drawings were made by Prof. G. O. Sars during the expedition, also 3 *a*. Part of a blastostyle). 3 *b*. Blastostyle. 3 *c*. Longitudinal section through a gonophore; T = Tentacle, O = Ovum.
- „ 4. *Lampra atlantica*, n. sp. (Drawn from contracted and somewhat damaged spirit specimens). 4 *a* & *b*. Sections through early rudiment of gonophore, to show the development of the pseudomedusoid gonophores. 4 *c*. Transverse section through fully developed gonophore. Ekt = Ectoderm, Ent = Endoderm.







Plate III.



### Tab. III.

- Fig. 1. *Lampra purpurea*, n. sp., nat. St. 1 a. Stykke af en Blastostyl. (Begge Tegninger er udført af Prof. G. O. Sars under Exp.).
- „ 2. *Monobrachium parasiticum*, Mereschowsky, nat. St. 2 a. Hydranth og Gonofor af samme, forstørret. 2 b. Del af et Tversnit gennem Gonofor, viser en Radialkanal, rk, og et Par Generationsorg., G. 2 c. Del af Længdesnit gj. Gonofor, viser det rudimentære Manubrium, m.
- „ 3—4. *Myriothela*, sp. Tegnet efter medtagne Spiritusexemplarer. Paa Fig. 3 sees en liden, sandsynligvis abnorm, Udvæxt, K. 3 a fremstiller et Længdesnit gj. denne.
- „ 5. Snit gj. en Tentakel af *Myriothela*. 5 a. Distale Del af denne, sterkere forstørret.
- „ 6 a—e. Snit gj. forskellige Udviklingsstadier af Gonoforer. (a—b fra *M. minuta*, c—e fra *M. mitra*).

### Plate III.

- Fig. 1. *Lampra purpurea*, n. sp., nat size. 1 a. Piece of a blastostyle. (Both drawings are made by Prof. G. O. Sars during the expedition).
- „ 2. *Monobrachium parasiticum*, Mereschowsky, nat. size. 2 a. Hydranth and gonophore of the same, magnified. 2 b. Part of a cross section through a gonophore; rk = radial canal, C = generative organs. 2 c. Part of a longitudinal section through a gonophore; m = the rudimentary manubrium.
- „ 3 & 4. *Myriothela*, sp. Drawn from damaged spirit specimens. In fig. 3 there is a small (probably abnormal) growth, K. 3 a. A longitudinal section through the latter.
- „ 5. Section through a tentacle of *Myriothela*. 5 a. Distal portion of the above, more highly magnified.
- „ 6 a—e. Sections through various stages of gonophore's development. (a, b from *M. minuta*, c—e from *M. mitra*).

Fig.1 et la G.O.Sars del. Fig.2 6 Bonnevie del.





Plate IV.

## Tab. IV.

- Fig. 1. *Myriothela gigantea*, n. sp., nat. St. a. Han.  
b. Hun.
- „ 2. *Myriothela verrucosa*, n. sp., nat. St. 2 a. Del af  
Snit gj. en Gonofor, viser en af dens Neslecelle-  
tuberkler.
- „ 3. *Myriothela mitra*, n. sp., nat. St. 3 a. Blastostyl  
af samme. 3 b. Snit gj. Hydranthen.
- „ 4. *Myriothela minuta*, n. sp., forstørret. 4 a. Bla-  
stostyl af samme.
- „ 5. *Myriothela phrygia*? Fabr., nat. St. (Længden er  
større end paa Fig.). 5 a. Blastostyler med Go-  
noforer af begge Kjøen. (Disse Fig. er udførte af  
Prof. G. O. Sars under Exp.; de to øverste Rækker  
af Blast. er af ham merkede med ♂, men i Virke-  
ligheden er kun den øverste Række af Hankjøen,  
og de tre nederste af Hunkjøen). 5 b. Exemplar  
af *M. phrygia*, fundet ved Hammerfest.
- „ 6. Snit gj. Hydranthens Væg hos *M. phrygia*.
- „ 7. Del af Snit gj. Blastostyl, viser en Gonofor, hvis  
Udvikling er hæmmet.

## Plate IV.

- Fig. 1. *Myriothela gigantea*, n. sp., nat. size, a, male;  
b, female.
- „ 2. *Myriothela verrucosa*, n. sp., nat. size. 2 a. Part  
of section through a gonophore, showing one of  
its stinging cell tubercles.
- „ 3. *Myriothela mitra*, n. sp., nat. size. 3 a. Blast-  
style of the same. 3 b. Section through hydranth.
- „ 4. *Myriothela minuta*, n. sp., magnified. 4 a. Bla-  
stostyle of the same.
- „ 5. *Myriothela phrygia*? Fabr., nat. size. (The length  
is greater than in the figure). 5 a. Blastostyles  
with gonophores of both sexes. (These figures  
were drawn by Prof. G. O. Sars during the ex-  
pedition; the two upper rows of blastostyles are  
marked by him with ♂; but in reality only the  
uppermost row are males, the three lowest being  
females). 5 b. Specimen of *M. phrygia*, found at  
Hammerfest.
- „ 6. Section through the wall of the hydranth in  
*M. phrygia*.
- „ 7. Part of section through blastostyle, showing a go-  
nophore whose development has been checked.







Plate V.

### Tab. V.

- Fig. 1. *Halecium irregulare*, n. sp., nat. St. 1 *a.* Del af samme, forstørret.
- „ 2. Hydrotheker af forskj. Arter af *Lafoëa*, forst. *a.* *L. gracillima*, *b.* *L. fruticosa*, *c.* *L. symmetrica*, (*c'*. Varietet af denne), *d.* *L. dumosa*.
- „ 3. Coppinia af *L. fruticosa*, forst. 3 *a.* Del af samme, sterkt forst.
- „ 4. Coppinia af *L. symmetrica*, forst. 4 *a.* Den samme, sterkt forstørret.
- „ 5. Coppinia af *L. serpens*, forst.
- „ 6. Coppinia af *L. abietina*, forst.
- „ 7. Coppinia af *L. dumosa*, forst. 7 *a.* Sterkere forstørret. 7 *b.* Snit gj. samme.

### Plate V.

- Fig. 1. *Halecium irregulare*, n. sp., nat. size. 1 *a.* Part of the same, magnified.
- „ 2. Hydrothecæ of various species of *Lafoëa*, magnified, *a.* *L. gracillima*, *b.* *L. fruticosa*, *c.* *L. symmetrica*, (*c'*. variety), *d.* *L. dumosa*.
- „ 3. Coppinia of *L. fruticosa*, magnified. 3 *a.* Part of the same, highly magnified.
- „ 4. Coppinia of *L. symmetrica*, magn. 4 *a.* The same, highly magnified.
- „ 5. Coppinia of *L. serpens*, magn.
- „ 6. Coppinia of *L. abietina*, magn.
- „ 7. Coppinia of *L. dumosa*, magn. 7 *a.* The same, more highly magnified. 7 *b.* Section through the same.







Plate VI.



## Tab. VI.

- Fig. 1. *Lafoëa pinnata*, G. O. Sars, nat. St. Sc = Scapus.  
 1 *a.* Del af samme, forstørret. 1 *b.* Scapus for-  
 størret. 1 *c.* Fuldt udv. Gonangium.  
 „ 2. *Lafoëa gigantea*, n. sp., nat. St. 2 *a* og *b.* Hy-  
 drotheker af samme, forstørret.  
 „ 3. *Selaginopsis obsoleta*, Lepechin. 3 *a.* Del af samme,  
 forstørret.  
 „ 4. *Selaginopsis arctica*, n. sp. 4 *a.* Del af samme,  
 forstørret.

## Plate VI.

- Fig. 1. *Lafoëa pinnata*, G. O. Sars, nat. size. Sc = Scapus.  
 1 *a.* Part of the same, magnified. 1 *b.* Scapus  
 magnified. 1 *c.* Fully developed gonangium.  
 „ 2. *Lafoëa gigantea*, n. sp., nat. size. 2 *a* & *b.* Hy-  
 drothecæ of the same, magnified.  
 „ 3. *Selaginopsis obsoleta*, Lepechin. 3 *a.* Part of the  
 same, magnified.  
 „ 4. *Selaginopsis arctica*, n. sp. 4 *a.* Part of the same,  
 magnified.







Plate VII.

### Tab. VII.

- Fig 1. *Plumularia fragilis*, Hamann, nat. St. 1 *a*. Del af samme, forstørret.
- „ 2. *Plumularia rubra*, n. sp., nat. St. 2 *a*. Del af samme, forstørret.
- „ 3. *Plumularia variabilis*, n. sp., nat. St. 3 *a*. Del af samme, forstørret.
- „ 4. *Aglaophenia compressa*, n. sp. 4 *a—c*. Dele af samme, forstørret, 4 *d*. Gonangiebærende Gren, hvis Udgangspunkt sees paa 4 *a*.
- „ 5. *Dynamena unilateralis*, n. sp., nat. St. 5 *a—c*. Dele af samme, forstørret.

### Plate VII.

- Fig. 1. *Plumularia fragilis*, Hamann, nat. size. 1 *a*. Part of the same, magnified.
- „ 2. *Plumularia rubra*, n. sp., nat. size. 2 *a*. Part of the same, magnified.
- „ 3. *Plumularia variabilis*, n. sp., nat. size. 3 *a*. Part of the same, magnified.
- „ 4. *Aglaophenia compressa*, n. sp. 4 *a—c*. Parts of the same, magnified. 4 *d*. Gonangia-bearing branch, of which the issuing point is visible in fig. 4 *a*.
- „ 5. *Dynamena unilateralis*, n. sp., nat. size. 5 *a—c*. Parts of the same, magnified.







Plate VIII.

### Tab. VIII.

Alle Fig. er udførte efter Skizzer, tagne af G. O. Sars under Expeditionen og med nedenstaaende Navne vedtøiet:

- Fig. 1. *Aequorea*, sp.? Station 124.  
 „ 2. *Syncoryne*, sp.? } Beeren Eiland.  
 „ 3, 3 a. *Bougainvillia*, sp.? }  
 „ 5, 5 a. *Eucope*, sp.? Isfjorden, Spitsbergen.

### Plate VIII.

All the figures are drawn from sketches made by Prof. G. O. Sars during the expedition, and have the following names affixed:

- Fig. 1. *Aequorea*, sp.? St. 124.  
 „ 2. *Syncoryne*, sp.? } Bear Island.  
 „ 3, 3 a. *Bougainvillia*, sp.? }  
 „ 5, 5 a. *Eucope*, sp.? Isfjord on Spitzberg.





2.



4.



3.



3.a



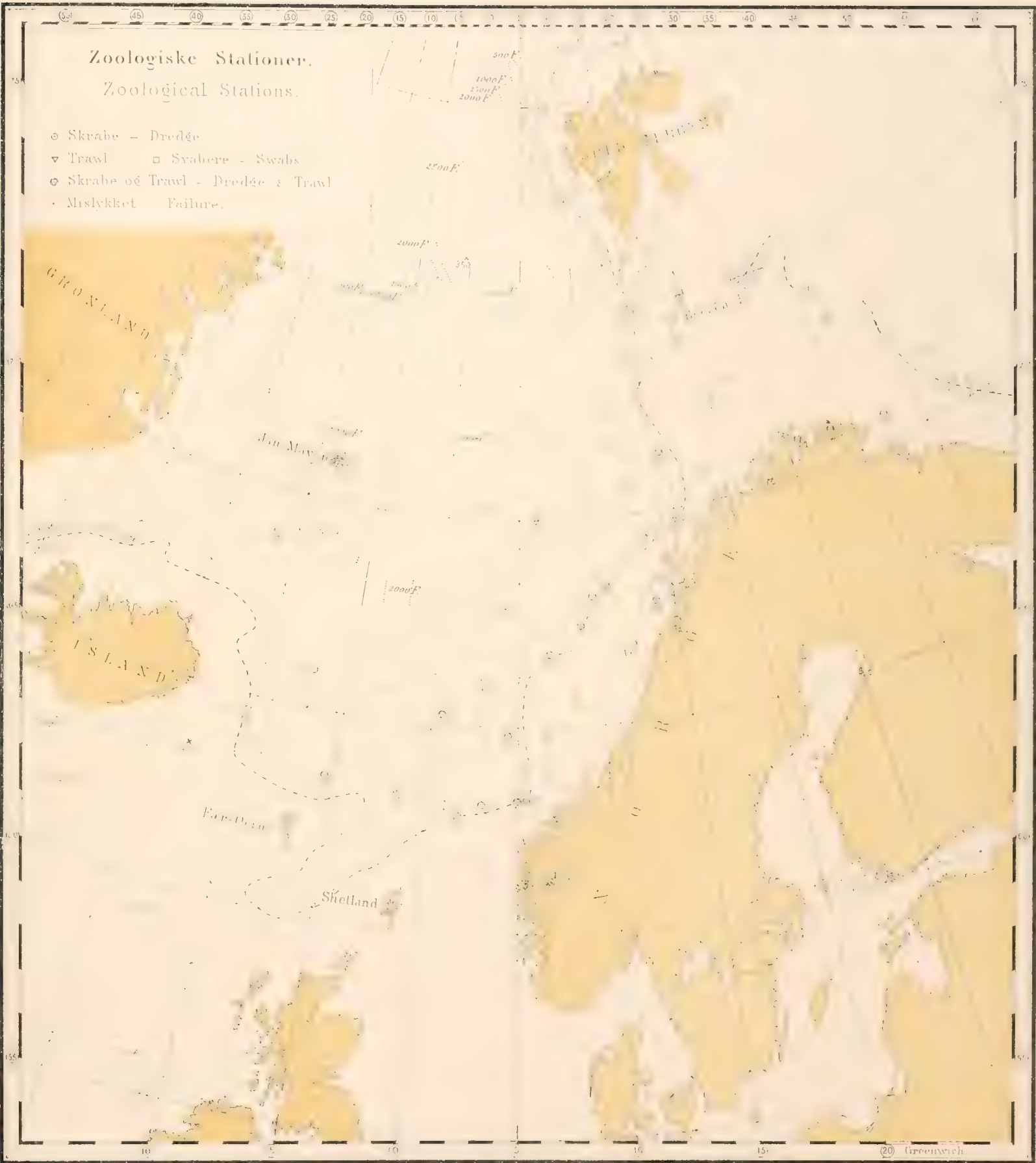
5.a



5











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The publication of the Report, for which a grant of money has been obtained from the Norwegian Storthing, is conducted in conformity with the directions of His Norwegian Majesty's Government, on whose behalf the Editorial Committee have the honour of presenting

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DEN NORSKE NORDHAVS-EXPEDITION  
1876—1878.

---

ZOOLOGI.

POLYZOA.

VED

O. NORDGAARD.

MED 1 PLANCHE OG 1 KART.



---

CHRISTIANIA.  
GRØNDAHL & SØNS BOGTRYKKERI.  
1900.

THE NORWEGIAN NORTH-ATLANTIC EXPEDITION  
1876—1878.

---

ZOOLOGY.

---

POLYZOA.

BY

O. NORDGAARD.

WITH 1 PLATE AND 1 MAP.



---

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1900.





I det følgende har jeg leveret en systematisk for-  
tegnelse over de polyzoer, som indsamledes under Nord-  
havsekspektionen. Forat der ikke skal reises tvil om hvilke  
former, jeg har ment, er der angivet etpar steder, hvor der  
findes en ordentlig beskrivelse af arten. I regelen har jeg  
henvist til Smitt og Hincks. Tallene i ( ) refererer sig til  
litteraturfortegnelsen.

*Bergen, oktober, 1899.*

I have here given a systematic list of the Polyzoa  
collected during the North Atlantic Expedition. In order  
that there shall be no doubt as to which forms I have  
meant, two or three places are mentioned where a proper  
description of the species is to be found. I have gene-  
rally referred to Smitt and Hincks. The figures in brackets  
refer to the Bibliography.

*Bergen. October, 1899.*





## Cheilostomata.

### Fam. Eucratidae.

#### Gen. Gemellaria.

##### *Gemellaria loricata*, Linn.

Smitt, (24, III), p. 286, 324, tab. 17, fig. 54.

Hincks, (8), p. 18, tab. 3, fig. 1—4.

**Findesteder.** St. 315, 322, 343, 363, Spitsbergen.

Arten har stor udbredelse paa grundt vand i arktiske farvand. Den er saaledes tagen paa begge sider af det amerikanske kontinent, er karakteristisk for de grunde sund i Finmarken og forekommer ogsaa i mængde og frodig udvikling ved den finmarkske havkyst, f. eks. ved Nordkap og Nordkyn.

### Fam. Cellulariidae.

#### Gen. Menipea.

##### *Menipea ternata*, Ell. et Sol.

*Cellularia ternata*, Smitt, (24, III), p. 282, 305, tab. 16, fig. 10—26.

*Menipea ternata*, Hincks, (8), p. 38, tab. 6, fig. 1—4.

**Findesteder.** Kjosen, St. 223, Beeren Eiland, Spitsbergen.

Ligesom foregaaende er denne ogsaa en af de almindeligste arktiske polyzoer. De forskellige arter, som er opstillede inden Smitts *Cellularia ternata*-gruppe, bør vistnok rettest opfattes som varieteter.

## Cheilostomata.

### Fam. Eucratidæ.

#### Gen. Gemellaria.

##### *Gemellaria loricata*, Linn.

Smitt (24, III), pp. 286, 324; Pl. XVII, fig. 54.

Hincks (8), p. 18; Pl. III, figs. 1—4.

**Occurrence.** St. 315, 322, 343, 363, Spitsbergen.

This species has a wide distribution in shallow water in the arctic seas. It was taken, for instance, on both sides of the American continent, is characteristic of the shallow sounds in Finmark, and occurs also in quantities, and in a state of vigorous development on the Finmark coast, e. g. at the North Cape and at Nordkyn.

### Fam. Cellulariidæ.

#### Gen. Menipea.

##### *Menipea ternata*, Ell. & Sol.

*Cellularia ternata*, Smitt (24, III), pp. 282, 305; Pl. XVI, figs. 10—26.

*Menipea ternata*, Hincks (8), p. 38; Pl. VI, figs. 1—4.

**Occurrence.** Kjosen, St. 223, Bear Island, Spitsbergen.

This, like the preceding species, is one of the commonest arctic Polyzoa. The various species which have been set up in Smitt's *Cellularia ternata* group, ought more properly to be regarded as varieties.

**Menipea jeffreysii**, Norman.

Hincks, (8), p. 42, tab. 9, fig. 1—2.

Norman, (17, vol. 12), p. 446, tab. 19, fig. 1.

Nordgaard, (18, I), p. 11, tab. 2, fig. 5.

**Findesteder.** St. 10, 18.

Arten er tagen hist og her langs Norges kyst fra Bergen til Østfinmarken; er forøvrigt kun kjendt fra Shetland. Jeg har i de to sidste aar fundet den flere gange i fjordene ved Bergen. Alle de eksemplarer, jeg har seet, har været forsynede med det eiendommelige kitinøse støtteapparat.

**Menipea normani**, n. sp.\*).

Tab. I, fig. 2—8.

**Findesteder.** St. 31, 200, 323.

Jeg har vistnok ikke havt tilstrækkelig literatur til at gjøre mig bekendt med alle *menipea*-arter, som er opført i Jelley's katalog, men da jeg tror, det er overveiende sandsynlighed for, at den *Menipea*, jeg har havt mellem hænder, er ny og ubeskreven, vil jeg her i korthed karakterisere den.

Zoariet udspringer fra en enkelt stamme, som er sammensat af kitintuber, og hvis nedre ende er fæstet til en smaasten eller lignende. Grenene er dikotomisk delte og ligger ikke alle i samme plan. De er støttede af kitintuber, som næsten udelukkende forløber efter bagsiden. Zoócierne er forlængede og ordnede i en dobbeltrække. Munden oval og mundingsranden noget ophøiet. Ved den distale rand sidder 3—5 børster eller pigger. Disse kan paa de ypperste zoócier i grenene have en længde af 0.8—1.0 mm

Der er to slags avicularier. De laterale er ganske smaa, og de sidder saa langt bagud, at de tildels ikke sees, naar grenen ligger i frontstilling. Derimod rager front-aviculariet, som er fæstet lige under den proximale mundingsrand, langt frem over munden. Den lille mandibel, som sidder i toppen, er rettet nedad. Oóciernes længde er større end bredden, paa mange forekommer bugtede fortykkelser i frontvæggen. Til operculum saaes ikke spor af antydning. Kolonierne var ikke saa godt konserverede, at noget sikkert kan siges om polypidet.

De oven omtalte kitintuber udspringer fra den nederste del af zoócierne, hvorefter de forløber efter zoóciernes bagside for tilslut at samle sig i en enkelt stamme, som saaledes bestaar af en bundt af kitinrør. I dette stykke er der altsaa stor overensstemmelse mellem *M. jeffreysii* og

**Menipea jeffreysii**, Norman.

Hincks (8), p. 42; Pl. IX, figs. 1, 2.

Norman (17, Vol. 12), p. 446; Pl. XIX, fig. 1.

Nordgaard (18, I), p. 11; Pl. II, fig. 5.

**Occurrence.** St. 10, 18.

This species is found here and there along the coast of Norway from Bergen to East Finmark. Otherwise it is only known from the Shetland Isles. During the last two years, I have found it several times in the fjords round Bergen. All the specimens I have seen, have been furnished with the peculiar, chitinous case.

**Menipea normani**, n. sp.\*).

Pl. I, figs. 2—8.

**Occurrence.** St. 31, 200, 323.

My knowledge of the literature on this subject is not sufficient to have made me acquainted with all the *Menipea* species that appear in Jelley's catalogue; but as I think there is every probability that the *Menipea* I have had in my hands is new and hitherto undescribed, I will here briefly characterise it.

The zoarium springs from a single stem which is composed of chitinous tubes, and whose lower end is attached to a small stone or something similar. The branches are dichotomous, and do not all lie in the same plane. They are supported by chitinous tubes, which run almost exclusively along the posterior side. The zoöcia are elongated, and arranged in a double row. The mouth is oval, and its edges somewhat elevated. On the distal margin there are from 3 to 5 bristles or spines. On the outermost zoöcia in the branch, these may be from 0.8 to 1 mm. in length.

There are two kinds of avicularia. The lateral are quite small, and are placed so far back that they sometimes cannot be seen when the branch is viewed from the front. The front avicularium, on the other hand, which is attached just below the proximal margin of the aperture, extends far over the aperture. The little mandible, which is situated at the top, is directed downwards. The length of the oöcia is greater than their breadth; in many there are curved expansions of the anterior wall. There is no sign of any operculum. The colonies were not in such a good state of preservation as to allow of anything certain being said about the polypides.

The above-mentioned chitinous tubes spring from the lowest part of the zoöcia, and then run along their posterior side, to unite at last in a single stem, which thus consists of a bundle of chitinous tubes. In this respect therefore, there is a great similarity between *M. jeffreysii*

\*) Opkaldt efter the Rev. Canon Norman, som har leveret store bidrag til udforskningen af vor marine fauna.

\*) Named after the Rev. Dr. Norman, who has made large contributions to the knowledge of our marine fauna.

*M. normani*\*). Man ser ogsaa tildels, at en kitintube forløber langs en bifurkation paa samme maade, som fremstillet af Norman (Notes on rare British Polyzoa, Quarterly Journ. Mic. Sc., vol. 8, n. s., tab. 5, fig. 6). Mellem rodtraadene (tubular fibres, radical fibres) hos *M. ternata* og kitintuberne hos de to andre arter er der neppe nogen anden forskjel end, at de hos den første udspringer under en ret vinkel, mens de hos *M. jeffreysi* og *M. normani* udspringer saa spidsvinklet, at de løber efter zoariet, for hvilket tuberne saaledes tjener som et effektivt støtteapparat.

Fra *M. jeffreysi* adskilles min art let ved sine store frontavicularier og manglende operculum.

Det kan have sin interesse at stille sig for øie de naturlige forhold paa de tre steder, hvor arten forekom:

St. 31. 763 m., sandler.  $t = -1.00^{\circ} \text{ C.}$   
 „ 200. 1134 - „ ler.  $t = -1.00^{\circ} -$   
 „ 323. 408 - „ ler.  $t = -1.95^{\circ} -$

Den er saaledes hentet op fra et dyb af 1154 meter med iskoldt vand, og sammen med *Kinetoskias arborescens* deler den æren af at have levet i en afstand fra sjøens overflade som er større end 1000 meter.

Koloniernes længde	3—6.5 cm.
Zoöciemundingens længde	0.3 mm.
— bredde	0.14 „
Frontaviculariets længde	0.24—0.3 „
Kitintubernes tykkelse	0.036—0.06 „

### Gen. *Scrupocellaria*.

#### *Scrupocellaria reptans*, Linn.

*Cellularia reptans*, Smitt (24, III), p. 284, 318, tab. 17, fig. 37—41.

*Scrupocellaria reptans*, Hincks, (8)- p. 52, tab. 7, fig. 1—7.

**Findested.** Brandø Sund.

Denne art vides ikke med sikkerhed at være observeret i den arktiske del af vort land. M. Sars (22) opfører vistnok *Cellularia reptans* som almindeligt forekommende i Havø Sund og ved Hammerfest, men det foreligger sandsynligvis her en forveksling med *Menipea ternata*. Baade Norman og jeg har taget arten i Trondhjemsfjorden, men nordenfor er den endnu ikke funden.

and *M. normani*\*). A chitinous tube may also sometimes be seen running along a bifurcation in the way described by Norman (Notes on Rare British Polyzoa. Quarterly Journ. Micros. Sci., Vol. 8, n. s. Pl. V, fig. 6). There is hardly any difference between the radical fibres in *M. ternata*, and the chitinous tubes in the two other species, except that in the first they spring out at right angles, while in *M. jeffreysi* and *M. normani* they spring out at such an acute angle that they follow the zoarium, and thus serve as an effective support.

My species is easily distinguished from *M. jeffreysi* by its large anterior avicularia and the absence of an operculum.

It may be interesting to observe the natural conditions in the three places where the species occurred. These were as follows:

St. 31, depth 763 m., sandy clay, temp.  $-1.00^{\circ} \text{ C.}$   
 „ 200, „ 1134 - „ clay „  $-1.00^{\circ} -$   
 „ 323, „ 408 - „ clay „  $-1.50^{\circ} -$

It has thus been brought up from a depth of 1134 metres, from ice-cold water; and it shares with *Kinetoskias arborescens* the honour of having lived at a distance of more than 1000 metres below the surface of the sea.

Length of colony	from 3—6.5 cm.
Length of the aperture	0.3 mm.
Breadth of the „	0.14 -
Length of anterior avicularium	from 0.24—0.3 -
Thickness of chitin tubes	from 0.036—0.06 -

### Gen. *Scrupocellaria*.

#### *Scrupocellaria reptans*, Linn.

*Cellularia reptans*, Smitt (24, III), pp. 284, 318; Pl. XVII, figs. 37—41.

*Scrupocellaria reptans*, Hincks (8), p. 52; Pl. VII, figs. 1—7.

**Occurrence.** Brandø Sund.

This species is not known with certainty to have been observed in the arctic portion of Norway. M. Sars (22), indeed, specifies *Cellularia reptans* as of common occurrence in Havø Sund and at Hammerfest; but this is probably through confounding it with *Menipea ternata*. Both Norman and I have found the species in the Trondhjem Fjord, but farther north it has not yet been found.

\*) I min fortegnelse har jeg tydet disse kitintuber som hydroidrør (18, II, p. 11, tab. 2, fig. 5). Dette er nok ikke rigtigt. Vistnok finder man ofte ogsaa ledsagende hydroider saaledes som angivet paa min oven citerede figur, men de egentlige kitintuber udspringer baade hos *M. normani* og *M. jeffreysi* fra zoöciernes nederste parti, og de maa saaledes kunne opfattes som svarende til rodtraadene hos *M. ternata*.

\*) In my list, I have interpreted these chitinous tubes as hydroid tubes (18, II, p. 11; Pl. II, fig. 5). This is not correct. It is true that accompanying hydroids are often found as represented in my above-mentioned figure; but the true chitin tubes, both in *M. normani* and *M. jeffreysi*, spring from the lowest portion of the zoöcia, and might thus be supposed to answer to the root fibres in *M. ternata*.



Fam. **Bicellaridae.**Gen. **Bicellaria.****Bicellaria alderi.** Busk.

Smitt (24, III), p. 289, 335, tab. 18, fig. 4—8.

Hincks (8), p. 70, tab. 9, fig. 3—7.

**Findesteder.** St. 10, 315.

Levensen (14) opfører ikke den form for Danmark, men ifølge Hincks er den tagen ved Shetland, og i Norge har jeg observeret arten paa forskellige steder fra Bergen til Lofoten. Den er hidtil ikke omtalt fra arktiske egne, og naar saaledes arten pludselig viser sig saa langt mod nord som paa St. 315 (74° 53' N. B.), maa denne omstændighed vistnok kunne anføres som et eksempel paa Golfstrømmens evne til at flytte boreale former mod højere breddegrader.

**Anm.** I min fortegnelse over norske *Cheilostomata* (18, I) har jeg opført *Bicellaria ciliata*, Linn. som funden af M. Sars i Kristianiafjorden. Jeg har senere taget denne vakre form paa *Bicellaria alderi* i Hjeltefjorden, og arten kan saaledes med sikkerhed opføres som hørende til Norges fauna.

Gen. **Bugula.****Bugula murrayana,** Johnst.

Smitt (24, III), p. 291, 349, tab. 18, fig. 19—27.

Hincks (8), p. 92, tab. 14, fig. 2—9.

**Findesteder.** St. 260, 322, Spitsbergen.

Var. *fruticosa*, Pack, Advent Bay.

Var. *quadridentata*, Lov., St. 10, 18, 262, 315.

I arktiske farvand synes varieteterne at være almindeligere end den typiske form.

**Bugula purpureotincta,** Norman.

Hincks (8), p. 89, tab. 12, fig. 8—12.

**Findested.** Kjosen.

Arten er funden paa forskellige steder langs Skandinaviens kyst, men den nordligste hidtil kjendte forekomst er Kjosen. Jeg tog den vinteren 1899 i Malangenfjord fastvokset til en hydroid (100—200 m.).

Fam. **Bicellaridæ.**Gen. **Bicellaria.****Bicellaria alderi.** Busk.

Smitt (24, III), pp. 289, 335; Pl. XVIII, figs. 4—8.

Hincks (8), p. 70; Pl. IX, figs. 3—7.

**Occurrence.** St. 10, 315.

Levensen (14) does not give this form for Denmark, but according to Hincks it is found in the Shetland Isles, and I have observed the species in Norway in several places from Bergen to Lofoten. It has not yet been reported from arctic regions; and when the species thus suddenly appears so far north as St. 315 (74° 53' N. Lat.), the circumstance might certainly be quoted as an instance of the power of the Gulf Stream to carry boreal forms up into higher latitudes.

**Remark.** In my list of Norwegian *Cheilostomata* (18, I), I have entered *Bicellaria ciliata*, Linn. as found by M. Sars in the Kristiania Fjord. I have since found this beautiful form on *Bicellaria alderi* in Hjeltefjorden; and the species may thus safely be put down as belonging to the fauna of Norway.

Gen. **Bugula.****Bugula murrayana,** Johnst.

Smitt (24, III), pp. 291, 349; Pl. XVIII, figs. 19—27.

Hincks (8), p. 92; Pl. XIV, figs. 2—9.

**Occurrence.** St. 260, 322, Spitsbergen;

Var. *fruticosa*, Pack, Advent Bay;

Var. *quadridentata*, Lov, St. 10, 18, 262, 315.

In arctic waters, the varieties seem to be more general than the typical form.

**Bugula purpureotincta,** Norman.

Hincks (8), p. 89; Pl. XII, figs. 8—12.

**Occurrence.** Kjosen.

This species is found in various places along the coast of Scandinavia; but the most northerly place at which it has hitherto been known to occur is Kjosen. I found it at the beginning of 1899 in Malangenfjord, grown fast to a hydroid (100—200 m.).

Gen. **Kinetoskias**.**Kinetoskias smittii**, Koren et Dan.

Koren et Danielsen (13), p. 104, tab. 3, fig. 12—14, tab. 12, fig. 4—8.

Norman (17, vol. 12), p. 448, tab. 19, fig. 2—4; vol. 13, p. 112.

Denne art forekom vistnok ikke blandt Nordhavsekspeditionens materiale, men jeg tager den med her alligevel, fordi jeg vinteren 1899 tog den blandt andre steder ogsaa i den indre del af Vestfjorden, som gik ind under ekspeditionens undersøgelsesfelt.

Det har ogsaa sin interesse, at *K. smittii* hører til de polyzoer, som gaar dybest ned.

I Tranödybet (Vestfjorden) tog jeg nemlig 16de Marts 1899 et eksemplar i en dybde af 607—640 m. Arten er funden paa forskellige steder langs den norske fra Korsfjorden til Slotholmen i Nordland.

**Kinetoskias arborescens**, Koren et Dan.

Koren et Dan. (13), p. 107, tab. 12, fig. 9—14.

*Bugula umbella*, Smitt (24, III), p. 292, 353, tab. 19, fig. 28—31.

**Findesteder.** St. 2, 23, 31.

Norman (17, vol. 13) har undersøgt eksemplarer fra Karahavet og St. Lawrence og paa de førstnævnte tillige fundet oócier, som lignede oócierne hos den foregaaende art.

*Kinetoskias arborescens* er hidtil kun funden i et eksemplar i Wijde Bay, Spitsbergen, i 40 favnes dyb, lerbund, af prof. Lovén. Dijnphna-ekspeditionen tog diverse eksemplarer i Karahavet (Levinson). Danielsen tog etpar ved Vadsø (90 favne, lerbund), endvidere er arten kjendt fra St. Lawrencebugten (Whiteaves). Det er saaledes interessant at kunne konstatere artens tilstedeværelse paa St. 2 (Sognefjorden). Paa dette sted var dybden 1229 meter, hvilket er den største hidtil kjendte sænkning af bunden i nogen norsk fjord. Bunden bestod af sandig ler og temperaturen paa dybet 6°.7 C.

Fam. **Cellariidae**.Gen. **Cellaria**.**Cellaria fistulosa**, Linn.

Smitt (24, III), p. 362, 386, tab. 20, fig. 18—20.

Hincks (8), p. 106, tab. 13, fig. 1—4.

Denne art forekom blandt det mig tilstillede materiale, men uden angivelse af findested. Jeg har ellers taget samme paa forskellige steder fra Bergen til Lofoten.

Gen. **Kinetoskias**.**Kinetoskias smittii**, Koren & Dan.

Koren & Danielsen (13), p. 104; Pl. III, figs. 12—14; Pl. XII, figs. 4—8.

Norman (17, Vol. XII), p. 448; Pl. XIX, figs. 2—5; Vol. 13, p. 112.

This species did not, indeed, occur in the North Atlantic Expedition's collection, but I nevertheless include it here, because, among other places, I found it, in the early part of 1899, in the inner part of Vestfjorden, which was included in the Expedition's field of investigation.

It is also of some interest to note that *K. smittii* belongs to those Polyzoa that go deepest.

In Tranödybet (Vestfjord) on the 16th March, 1899, I took one specimen from a depth of between 607 and 640 metres. The species is found in various places along the Norwegian coast from Korsfjorden to Slotholmen in Nordland.

**Kinetoskias arborescens**, Koren & Dan.

Koren & Danielsen (13), p. 107; Pl. XII, figs. 9—14.

*Bugula umbella*, Smitt (24, III), pp. 292, 353; Pl. XIX, figs. 28—31.

**Occurrence.** St. 2, 23, 31.

Norman (17, vol. 13) has examined specimens from the Kara Sea and St. Lawrence, and on the former found oœcia that resembled the oœcia in the preceding species.

Only one specimen of *Kinetoskias arborescens* has hitherto been found in Wijde Bay, Spitsbergen, at a depth of 40 fathoms, clay bottom, by Prof. Lovén. The Dijnphna Expedition found several specimens in the Kara Sea (Levinson). Danielsen found a few at Vadsø (90 fathoms, clay bottom), and the species is further known from the Gulf of St. Lawrence (Whiteaves). It is thus interesting to be able to prove the presence of the species at Station 2 (Sogne Fjord). The depth here was 1229 metres, which is the greatest depression of the bottom hitherto known in any Norwegian fjord. The bottom consisted of sandy clay, and the temperature there was 6°.7 C.

Fam. **Cellariidae**.Gen. **Cellaria**.**Cellaria fistulosa**, Linn.

Smitt (24, III), pp. 362, 386; Pl. XX, figs. 18—20.

Hincks (8), p. 106; Pl. XIII, figs. 1—4.

This species occurred in the collection sent to me, but there was no statement as to where it was found. I have also found the same species in various places between Bergen and Lofoten.

## Fam. Flustridae.

Gen. *Flustra*.*Flustra membranaceo-truncata*, Smitt.

Smitt (24, III), p. 358, 376, tab. 20, fig. 1—5.

**Findesteder.** St. 262, 223 (Jan Mayen).

Denne *Flustra* er tagen paa mange steder i den arktiske zone fra Novaja Semlja til Grønland. Hincks (9) opfører den ogsaa fra Queen Charlotte Islands. Den er ny for Jan Mayen (st. 223). Efter sin forekomst maa denne form karakteriseres som en ægte arktisk *Flustra*, den er saaledes ikke iagttaget ved Storbritanniens kyst, og er endnu heller ikke funden ved Island.

*Flustra carbacea*, Ell. et Sol.

*Flustra papyrea*, Smitt (34, III), p. 359, 380, tab. 20, fig. 9—11.

*Flustra carbacea*, Hincks (8), p. 123, tab. 16, fig. 4, 4a; tab. 14, fig. 1.

**Findested.** Kjosen (10—14 favne).

Denne art har ogsaa en stor arktisk udbredelse og findes desuden ved Storbritanniens og Danmarks kyster.

*Flustra abyssicola*, M. Sars

G. O. Sars (21), p. 19, tab. 2, fig. 25—30.

**Findesteder.** St. 149 (Vestfjorden), 260 (Porsangerfjorden), 290, 323, 363.

Siden G. O. Sars fandt denne eiendommelige dybvandsflustra ved Guldbrandsøerne og Skroven (Vestfjorden) er den tagen i Gulf of St. Lawrence (Whiteaves) samt i Karahavet (Smitt).

Det største dyb, hvorfra arten blev hentet op paa Nordhavsekspeditionen var 475 m. (St. 363, lerbund, temp. 1<sup>o</sup>.1 C.) og det mindste 247 m. (St. 149, lerbund, temp. 4<sup>o</sup>.9 C.). Aviculariernes primitive form, koloniens rigide beskaffenhed og forekomsten paa store dyb tyder paa, at *F. abyssicola* er senior blandt de nulevende nordlige repræsentanter af slekten *Flustra*.

## Fam. Flustridæ.

Gen. *Flustra*.*Flustra membranaceo-truncata*, Smitt.

Smitt (24, III), pp. 358, 376; Pl. XX, figs. 1—5.

**Occurrence.** St. 262, 223 (Jan Mayen).

This *Flustra* was found in many places in the arctic zone from Novaja Semlja to Greenland. Hincks (9) also mentions it from the Queen Charlotte Islands. It is new to Jan Mayen (St. 223). Judging from its occurrence, this form must be characterised as a true arctic *Flustra*; it has, for instance, not been observed on the shores of Great Britain, nor has it been found in Iceland.

*Flustra carbacea*, Ell. & Sol.

*Flustra papyrea*, Smitt (34, III), pp. 359, 380; Pl. XX, figs. 9—11.

*Flustra carbacea*, Hincks (8), p. 123; Pl. XVI, figs. 4, 4a; Pl. XIV, fig. 1.

**Occurrence.** Kjosen (10—14 fathoms).

This species also has a wide arctic distribution, and is moreover found on the shores of Great Britain and Denmark.

*Flustra abyssicola*, M. Sars.

G. O. Sars (21), p. 19; Pl. II, figs. 25—30.

**Occurrence** St. 149 (Vestfjorden), 260 (Porsangerfjord), 290, 323, 363.

Since G. O. Sars found this peculiar deep-water *Flustra* at the Guldbrand Islands and Skraaven (Vestfjorden), it has been found in the Gulf of St. Lawrence (Whiteaves) and in the Kara Sea (Smitt).

The greatest depth from which this species was brought up during the North Atlantic Expedition was 475 metres (Station 363, clay bottom, temp. 1.1<sup>o</sup> C.), and the smallest, 247 m. (St. 149, clay bottom, temp. 4.9<sup>o</sup> C.). The primitive form of the avicularia, the rigid character of the colony, and its occurrence at great depths, indicate that *F. abyssicola* is one of the oldest among the northern representatives of the genus *Flustra* now in existence.



Fam. Membraniporidae.

Gen. Membranipora.

*Membranipora cornigera*, Busk.

*Membranipora flemingii* f. *cornigera*, Smitt (24, III), p. 367, tab. 24, fig. 1.

*Membranipora cornigera*, Hincks (8), p. 164, tab. 21, fig. 4; tab. 22, fig. 3.

**Findested.** St. 290.

Hincks (8, p. 165) angiver kun tre findesteder for denne art, nemlig Shetland, Outer Haaf, off the coast of Norway. Heraf fremgaar, at arten er yderst sparsom i sin forekomst. Ved de gaffeldelte pigger i munden er den saa let kjendelig, at overseen og forveksling ikke godt kan finde sted.

*Membranipora arctica*, D'Orb.

*Membranipora lineata* f. *sophiae*, Smitt (24, III), p. 365, tab. 20, fig. 24, 25.

*Membranipora arctica*, Lorenz (16), p. 85, tab. 1, fig. 1.

**Findested.** Norskøerne (Spitsbergen).

Arten dannede et sortagtig overdrag paa snegleskal.

*Membranipora spitsbergensis*, Smitt.

*Semiflustrella arctica*, D'Orb. (manuscript).

*Membranipora arctica*, Smitt (24, III), p. 367, 413, tab. 20, fig. 33—36.

*Membranipora spitsbergensis*, Bidentkap (1), p. 619.

**Findested.** Norskøerne.

Denne form, som let kjendes ved sin karakteristiske bagside (Smitt, l. c., fig. 34) er hidtil kun funden ved Spitsbergen. *Membranipora arctica* har jeg taget paa forskjellige steder i Finmarken, men den er ikke observeret saa langt syd som ved Storbritanniens kyster.

Fam. Membraniporidae.

Gen. Membranipora.

*Membranipora cornigera*, Busk.

*Membranipora flemingii* f. *cornigera*, Smitt (24, III), p. 367, Pl. XXIV, fig. 1.

*Membranipora cornigera*, Hincks (8), p. 164; Pl. XXI, fig. 4; Pl. XXII, fig. 3.

**Occurrence.** Station 290.

Hincks (8, p. 165) mentions only three places where this species has been found, viz. Shetland Isles, Outer Haaf, and off the coast of Norway. From this it appears that the species is of extremely rare occurrence. It is so easily recognisable by the forked spines at the mouth that it could not well be overlooked or mistaken.

*Membranipora arctica*, D'Orb.

*Membranipora lineata*, f. *sophiae*, Smitt (24, III), p. 365, Pl. XX, figs. 24, 25.

*Membranipora arctica*, Lorenz (16), p. 85; Pl. I, fig. 1.

**Occurrence.** Norwegian islands (Spitsbergen).

This species formed a blackish coating upon snail shells.

*Membranipora spitsbergensis*, Smitt

*Semiflustrella arctica*, D'Orb. (manuscript).

*Membranipora arctica*, Smitt (24, III), pp. 367, 413; Pl. XX, figs. 33—36.

*Membranipora spitsbergensis*, Bidentkap (1), p. 619.

**Occurrence.** Norwegian islands.

This form, which is easily recognised by its characteristic back (Smitt, l. c., fig. 34), has hitherto been found only at Spitsbergen. I have found *Membranipora arctica* in several places in Finmark, but it has not been observed as far south as the shores of Great Britain.

## Fam. Membraniporidae.

## Gen. Membranipora.

## Membranipora cornigera, Busk.

*Membranipora flemingii* f. *cornigera*, Smitt (24, III), p. 367, tab. 24, fig. 1.

*Membranipora cornigera*, Hincks (8), p. 164, tab. 21, fig. 4; tab. 22, fig. 3.

**Findested.** St. 290.

Hincks (8, p. 165) angiver kun tre findesteder for denne art, nemlig Shetland, Outer Haaf, off the coast of Norway. Heraf fremgaar, at arten er yderst sparsom i sin forekomst. Ved de gaffeldelte pigger i munden er den saa let kjendelig, at overseen og forveksling ikke godt kan finde sted.

## Membranipora arctica, D'Orb.

*Membranipora lineata* f. *sophiae*, Smitt (24, III), p. 365, tab. 20, fig. 24, 25.

*Membranipora arctica*, Lorenz (16), p. 85, tab. 1, fig. 1.

**Findested.** Norskøerne (Spitsbergen).

Arten dannede et sortagtig overdrag paa snegleskal.

## Membranipora spitsbergensis, Smitt.

*Semiflustra arctica*, D'Orb. (manuscript).

*Membranipora arctica*, Smitt (24, III), p. 367, 413, tab. 20, fig. 33—36.

*Membranipora spitsbergensis*, Bidentkap (1), p. 619.

**Findested.** Norskøerne.

Denne form, som let kjendes ved sin karakteristiske bagside (Smitt, l. c., fig. 34) er hidtil kun funden ved Spitsbergen. *Membranipora arctica* har jeg taget paa forskjellige steder i Finmarken, men den er ikke observeret saa langt syd som ved Storbritanniens kyster.

## Fam. Membraniporidae.

## Gen. Membranipora.

## Membranipora cornigera, Busk.

*Membranipora flemingii* f. *cornigera*, Smitt (24, III), p. 367 Pl. XXIV, fig. 1.

*Membranipora cornigera*, Hincks (8), p. 164; Pl. XXI, fig. 4; Pl. XXII, fig. 3.

**Occurrence.** Station 290.

Hincks (8, p. 165) mentions only three places where this species has been found, viz. Shetland Isles, Outer Haaf, and off the coast of Norway. From this it appears that the species is of extremely rare occurrence. It is so easily recognisable by the forked spines at the mouth, that it could not well be overlooked or mistaken.

## Membranipora arctica, D'Orb.

*Membranipora lineata*, f. *sophiae*, Smitt (24, III), p. 365; Pl. XX, figs. 24, 25.

*Membranipora arctica*, Lorenz (16), p. 85; Pl. I, fig. 1.

**Occurrence.** Norwegian islands (Spitsbergen).

This species formed a blackish coating upon snail-shells.

## Membranipora spitsbergensis, Smitt

*Semiflustra arctica*, D'Orb. (manuscript).

*Membranipora arctica*, Smitt (24, III), pp. 367, 413; Pl. XX, figs. 33—36.

*Membranipora spitsbergensis*, Bidentkap (1), p. 619.

**Occurrence.** Norwegian islands.

This form, which is easily recognised by its characteristic back (Smitt, l. c., fig. 34), has hitherto been found only at Spitsbergen. I have found *Membranipora arctica* in several places in Finmark, but it has not been observed as far south as the shores of Great Britain.

## Fam. Cribrilinidae.

## Gen. Cribrilina.

## Cribrilina punctata, Hassal.

*Escharipora punctata*, Smitt (24, IV), p. 4, 51, tab. 24, fig. 4—7.

*Cribrilina punctata*, Hincks (8), p. 190, tab. 26, fig. 1—4; tab. 24, fig. 3.

**Findesteder.** St. 315, 323.

Arten forekommer fra Karahavet til det sydvestlige Frankrig. Jeg har taget denne tilligemed den nærstaaende *C. annulata*, Fabr. paa forskellige steder langs den norske kyst.

## Fam. Porinidae.

## Gen. Tassarodoma.

## Tassarodoma gracile, M. Sars.

*Anarthropora borealis*, Smitt (24, IV), p. 8, 67, tab. 24, fig. 25—29.

*Porina borealis*, Hincks (8), p. 229, tab. 31, fig. 4—6.

**Findesteder.** Korsfjorden, St. 10, 290, 312.

Udbredt fra Spitsbergen til Portugal, Florida og Azorerne.

## Fam. Celleporellidae.

## Gen. Celleporella.

## Celleporella hyalina, Linn.

*Mollia hyalina*, Smitt (24, IV), p. 16, 109, tab. 25, fig. 84—85.

*Schizoporella hyalina*, Hincks (8), p. 271, tab. 18, fig. 8—10.

**Findesteder.** Norskøerne (paa gastropoder), St. 366 (paa alger).

Denne art er meget udbredt i arktiske farvand, og den strækker sig ogsaa langt mod syd, forekommer saaledes ved Australien, Sydafrika, Strait of Magellan, Kalifornien, etc. Den er saaledes i sin optræden en ren kosmopolit.

## Fam. Cribrilinidæ.

## Gen. Cribrilina.

## Cribrilina punctata, Hassal.

*Escharipora punctata*, Smitt (24, IV), pp. 4, 51; Pl. XXIV, figs. 4—7.

*Cribrilina punctata*, Hincks (8), p. 190; Pl. XXVI, figs. 1—4; Pl. XXIV, fig. 3.

**Occurrence.** St. 315, 323.

This species occurs from the Kara Sea to the south-west of France. I have found it together with the nearly-allied *C. annulata*, Fabr. in various places along the coast of Norway.

## Fam. Porinidæ.

## Gen. Tassarodoma.

## Tassarodoma gracile, M. Sars.

*Anarthropora borealis*, Smitt (24, IV), pp. 8, 67; Pl. XXIV, figs. 25—29.

*Porina borealis*, Hincks (8), p. 229; Pl. XXXI, figs. 4—6.

**Occurrence.** Korsfjorden, St. 10, 299, 312.

Extends from Spitsbergen to Portugal, Florida and the Azores.

## Fam. Celleporellidæ.

## Gen. Celleporella.

## Celleporella hyalina, Linn.

*Mollia hyalina*, Smitt (24, IV), pp. 16, 109; Pl. XXV, figs. 84, 85.

*Schizoporella hyalina*, Hincks (8), p. 271; Pl. XVIII, figs. 8—10.

**Occurrence.** Norwegian islands (on gastropods), St. 366 (on algæ).

This species is widely distributed in arctic seas, and it also extends far south, occurring in Australia, South Africa, Straits of Magellan, California, etc. It is thus quite a cosmopolitan in its occurrences.



## Fam. Myrizoidae.

## Gen. Schizoporella.

**Schizoporella unicornis**, Johnst. forma **ansata**, Hincks.

*Mollia vulgaris* forma **ansata**, Smitt (24, IV), p. 15, tab. 25, fig. 80.

*Schizoporella unicornis* f. **ansata**, Hincks (8), p. 239, tab. 35, fig. 3.

**Findested.** St. 312 (paa *Myrizoum coarctatum*).

Nævnte varietet er tagen paa forskellige steder ved Storbritaniens kyster samt af Lovén ved Hammerfest, hvor ogsaa jeg i 1894 fandt den ganske hyppig paa stene. Den er endvidere funden ved Grønland.

## Gen. Myrizoum.

**Myrizoum crustaceum**, Smitt.

Smitt (24, IV), p. 18, 114, tab. 25, fig. 88—91.

*Schizoporella crustacea*, Lorenz (16), p. 87, tab. 7, fig. 2.

**Findested** Norskøerne (Spitsbergen).

Denne høiarktiske form (Matotsschkin scharr, Kara-havet, halvøen Kola, Spitsbergen, Jan Mayen, Grønland) er funden i Finmarken. Jeg tog den i 1894 ved Sværholt.

**Myrizoum coarctatum**, M. Sars.

Tab. I, fig. 1.

Smitt (24, IV), p. 18, 119, tab. 25, fig. 92.

**Findesteder.** St. 270, 290, 223, 315, 323.

Denne art er ogsaa udpræget arktisk. I Finmarken er den paa sine steder temmelig almindelig, og jeg tog den vinteren 1899 saa langt syd som i Moskenstrømmen, hvilket er det sydligste sted ved den norske kyst, hvor arten har været observeret i dette aarhundrede.

## Fam. Escharidae.

## Gen. Porella.

**Porella laevis**, Flem.

Smitt (24, IV), p. 21, 134, tab. 26, fig. 120—123.

Hincks (8), p. 334, tab. 47, fig. 10—11.

**Findested.** St. 18.

Forekommer langs hele den norske vestkyst til Finmarken. Den er ogsaa tagen ved Shetland, Grønland, Spitsbergen, Novaja Semlja, i Karahavet, etc.

## Fam. Myrizoidæ.

## Gen. Schizoporella.

**Schizoporella unicornis**, Johnst. forma **ansata**, Hincks.

*Mollia vulgaris* forma **ansata**, Smitt (24, IV), p. 15; Pl. XXV, fig. 80.

*Schizoporella unicornis* f. **ansata**, Hincks (8), p. 239; Pl. XXXV, fig. 3.

**Occurrence.** St. 312 (on *Myrizoum coarctatum*).

The above variety has been found in several localities on the shores of Great Britain, and by Lovén at Hammerfest, where I also frequently found it in 1894, on stones. It has moreover been found in Greenland.

## Gen. Myrizoum.

**Myrizoum crustaceum**, Smitt.

Smitt (24, IV), pp. 18, 114; Pl. XXV, figs. 88—91.

*Schizoporella crustacea*, Lorenz (16), p. 87; Pl. VII, fig. 2.

**Occurrence.** Norwegian islands (Spitsbergen).

This high arctic form (Matotsschkin Scharr, the Kara Sea, the Kola Peninsula, Spitsbergen, Jan Mayen, Greenland) is also found in Finmark. I found it, in 1894, at Sværholt.

**Myrizoum coarctatum**, M. Sars.

Pl I, fig. 1.

Smitt (24, IV), pp. 18, 119; Pl. XXV, fig. 92.

**Occurrence.** St. 270, 290, 223, 315, 323.

This species is also emphatically arctic. It is rather common in some places in Finmark, and I found it in the beginning of 1899 as far south as Moskenstrømmen, which is the most southerly spot on the Norwegian coast where the species has been observed in the nineteenth century.

## Fam. Escharidæ.

## Gen. Porella.

**Porella lævis**, Flem.

Smitt (24, IV), pp. 21, 134; Pl. XXVI, figs. 120—123.

Hincks (8), p. 334; Pl. XLVII, figs. 10, 11.

**Occurrence.** Station 18.

Occurs all along the Norwegian coast up to Finmark. It has also been found off the Shetland Isles, Greenland, Spitsbergen, Novaja Semlja, in the Kara Sea, etc.

**Porella elegantula**, D'Orb.

*Eschara elegantula*, Smitt (24, IV), p. 24, 154, tab. 26, fig. 140—146.

*Porella elegantula*, Bidekap (1), p. 627, tab. 25, fig. 7, 8

**Findesteder.** St. 270, 223 (Jan Mayen).

Fra Jan Mayen har Lorenz (16, p. 89, 90) opført 4 arter af slægten *Porella*, nemlig *concinna*, *acutirostris*, *compressa* og *lævis*. Hertil blir nu ogsaa at føie *elegantula*.

**Gen. Escharoides.****Escharoides sarsii**, Smitt.

Smitt (24, IV), p. 24, 158, tab. 26, fig. 147—154.

**Findesteder.** Norskøerne, St. 270.

Arten er ren arktisk. Fra Tromsøsundet har jeg seet eksemplarer, som havde en lignende vekstform som *Lepralia foliacea* fra Englands kyst (f. eks. Plymouth sound), idet kolonierne dannede pladeformigt udbredte og sammenvoksede kavernøse masser. Se forøvrigt M. Sars (23, p. 141—144).

**Gen. Smittia.****Smittia palmata**, M. Sars.

? *Flustra solida*, Stimpson, Invertebrata of Grand Manan.

" " Nordgaard (18), p. 15.

*Eschara palmata*, M. Sars (23), p. 146.

" " Vigelius (31), p. 15, fig. 2, 3.

*Escharella palmata*, Smitt (24, IV), p. 10, 77, tab. 24, fig. 42—46.

" " Smitt (26), p. 21.

" " Smitt (27), p. 29.

" " Lorenz (16), p. 91.

" " Stuxberg (29), p. 112.

" " Levinsen (15), p. 14, tab. 27, fig. 3.

*Pseudo-flustra solida*, Bidekap (1), p. 618.

**Findesteder.** St. 18, 31, 48, 223, 251, 262, 267, 290, 326, 337, 363.

I min fortegnelse over norske polyzoer opførte jeg Sars's *Eschara palmata* som *Flustra solida*, Stimpson. Jeg havde dengang ikke seet noget eksemplar af arten, og henholdt mig til Jelleys katalog. Imidlertid behøver man ikke at se længe paa den forat finde ud, at den ikke godt kan henføres til slægten *Flustra*, og Bidekap (1), oprettede saaledes en ny slekt (*Pseudo-flustra*), hvor arten blev anbragt. Dette kunde visselig forsvares, men jeg har her foretrukket at opføre den som en *Smittia*, da aviculariets

**Porella elegantula**, D'Orb.

*Eschara elegantula*, Smitt (24, IV), pp. 24, 154; Pl. XXVI, figs. 140—146.

*Porella elegantula*, Bidekap (1), p. 627; Pl. XXV, figs. 7, 8.

**Occurrence.** St. 270, 223 (Jan Mayen).

Lorenz (16, pp. 89, 90) has established 4 species of the genus *Porella* from Jan Mayen, viz. *concinna*, *acutirostris*, *compressa* and *lævis*. To these must now also be added *elegantula*.

**Gen. Escharoides.****Escharoides sarsii**, Smitt.

Smitt (24, IV), pp. 24, 158; Pl. XXVI, figs. 147—154.

**Occurrence.** Norwegian islands, Station 270.

The species is purely arctic. I have seen specimens from Tromsø Sound, that had a form of growth similar to that of *Lepralia foliacea* from the English coast (e. g. Plymouth Sound), as the colonies form lamellarly expanded and aggregated cavernous masses. See also M. Sars (23, pp. 141—144).

**Gen. Smittia.****Smittia palmata**, M. Sars.

? *Flustra solida*, Stimpson, Invertebrata of Grand Manan.

" " Nordgaard (18), p. 15.

*Eschara palmata*, M. Sars (23), p. 146.

" " Vigelius (31), p. 15, figs. 2, 3.

*Escharella palmata*, Smitt (24, IV), pp. 10, 77; Pl. XXIV, figs. 42—46.

" " Smitt (26), p. 21.

" " Smitt (27), p. 29.

" " Lorenz (16), p. 91.

" " Stuxberg (29), p. 112.

" " Levinsen (15), p. 14; Pl. XXVII, fig. 3.

*Pseudo-flustra solida*, Bidekap (1), p. 618.

**Occurrence.** St. 18, 31, 48, 223, 251, 262, 267, 290, 326, 337, 363.

In my list of Norwegian polyzoans, I entered Sars's *Eschara palmata* as *Flustra solida*, Stimpson. I had not at that time seen any specimens of the species, and had followed Jelley's catalogue. It need not be looked at long, however, to see that it cannot well be referred to the genus *Flustra*, and Bidekap (1) therefore established a new genus (*Pseudo-flustra*), in which the species was placed. This may be quite justifiable, but I have preferred to enter it as a *Smittia*, as the position and structure of the avi-

stilling og bygning peger mod nært slegtsskab. Ældre zoécier viser tildels temmelig stor lighed med zoécierne hos *Smittia reticulata*. Da jeg for tiden ikke kan afgjøre, om Stimpson og Sars's arter er identiske, har jeg opført Sars's navn *palmata*.

I sin beskrivelse gjorde M. Sars opmærksom paa de bøjelige rør af kitinagtig beskaffenhed, som var fæstede til zoariumet.

Smitt (24, IV, p. 80), paapegede, at disse rør eller rodtraade (tubular fibres) udgik fra selve zoécierne og at de nærmede sig hinanden og tilslut voksede sammen til et knippe mod koloniens proximale ende. Ved hjælp af dette knippe var kolonierne fæstede til fremmede legemer paa bunden, saasom ormrør og lignende. Vigelius (31, p. 16) skriver: „They (the branches of the colony) are connected by numerous tubular fibres, originating on both sides of the zoarium from membranous rather pear-shaped envelopes, which cover certain zoecia (fig. 2)“. Disse tuber danner merkelig nok et slags forlængelse nedad af zoécierne, og deres betydning for koloniens liv, maa uden tvivl være at fungere som et støtteapparat, som holder det skjøre zoarium sammen, selv om det brækkes af paa forskellige steder.

#### *Smittia reticulata*, Mac Gill.

*Escharella legentilii*, Smitt (24, IV), p. 10, 81, tab. 24, fig. 47—52.

*Smittia reticulata*, Hincks (8), p. 346, tab. 48, fig. 1—5.

**Findested.** St. 290.

Arten er funden i Karahavet (Levinsen), ved Novaja Semlja (Smitt), Jan Mayen (Lorenz) og opføres ogsaa for Grønland. Men den er ingen arkticus i streng forstand, den forekommer saaledes ved Englands og Frankrigs kyster, i Adriaterhavet, ja endog ved Nyzealand og Falklandsøerne.

#### *Smittia trispinosa*, Johnst.

Tab. I, fig. 9.

*Escharella jacotini*, Smitt (24, IV), p. 11, 86, tab. 24, fig. 53—57.

*Smittia trispinosa*, Hincks (8), p. 353, tab. 49, fig. 1—8.  
„ „ var. *arborea*, Levinsen (15), p. 16, tab. 27, fig. 7, 8.

**Findesteder.** St. 273, 326, 357.

Paa de nævnte steder forekom kun den af Levinsen opstillede eiendommelige form *arborea*. Denne varietet er tagen foruden af Dimphna- og Nordhavsekspeditionen ogsaa af Kückenthal og Walter ved Spitsbergen (Bidenkap). Jeg tog den vinteren 1899 i Porsangerfjorden, hvormed den

cularia indicate a close relationship. Older zoecia sometimes bear considerable resemblance to the zoecia in *Smittia reticulata*. As I cannot at present decide whether Stimpson's and Sars's species are identical, I have put down Sars's name, *palmata*.

M. Sars, in his description, drew attention to the flexible tubes of a chitinous consistency, that were attached to the zoarium.

Smitt (24, IV, p. 80) pointed out that these tubes or root-fibres (tubular fibres) issued from the zoecia themselves, and that they approached one another, and at last grew together into a bunch towards the proximal end of the colony. By means of this bunch, the colonies were attached to foreign bodies at the bottom, such as worm-casts, and the like. Vigelius (31, p. 16) writes: „They [the branches of the colony] are connected by numerous tubular fibres, originating on both sides of the zoarium from membranous, rather pear-shaped envelopes, which cover certain zoecia (fig. 2)“. These tubes, strange to say, form a kind of prolongation downwards of the zoecia, and their significance to the existence of the colony must without doubt be to act as a support to keep the brittle zoarium together, even if it be broken in several places.

#### *Smittia reticulata*, MacGill.

*Escharella legentilii*, Smitt (24, IV), pp. 10, 81; Pl. XXIV, figs. 47—52.

*Smittia reticulata*, Hincks (8), p. 346; Pl. XLVIII, figs. 1—5.

**Occurrence** Station 290.

The species has been found in the Kara Sea (Levinsen), at Novaja Semlja (Smitt), Jan Mayen (Lorenz), and is also recorded from Greenland. But it is not strictly speaking an arctic species, as it occurs on the coasts of England and France, in the Adriatic, and even off New Zealand and the Falkland Isles.

#### *Smittia trispinosa*, Johnst.

Pl. I, fig. 9.

*Escharella jacotini*, Smitt (24, IV), pp. 11, 86; Pl. XXIV, figs. 53—57.

*Smittia trispinosa*, Hincks (8), p. 353; Pl. XLIX, figs. 1—8.  
„ „ var. *arborea*, Levinsen (15), p. 16; Pl. XXVII, figs. 7, 8.

**Occurrence.** St. 273, 326, 357.

Levinsen's peculiar form *arborea* was the only one that occurred at the above places. This variety has not only been found by the Dimphna and North Atlantic Expeditions, but also by Kückenthal and Walter at Spitsbergen (Bidenkap). I found it in the early part of 1899



ogsaa kan indlemmes i Norges fauna. I den mudderfuldte hullhed af kolonierne fra St. 357 havde annelider og gefyreer tildels taget bolig.

### Gen. *Mucronella*.

#### *Mucronella abyssicola*, Norman.

Hincks (8), p. 369, tab. 38, fig. 1—2.

**Findesteder.** St. 48 (paa *retepora*), 223 (paa *myriozoum*), 225, 273.

#### *Mucronella labiata*, Boeck.

*Discopora coccinea* forma *labiata*, Smitt (24, IV), p. 27, 175, tab. 27, fig. 176.

**Findesteder.** St. 270, 290, 315.

Denne art forekommer svært ofte fastvokset til *Hornera lichenoides*.

Begge de sidstnævnte er fundne paa flere steder ved Norgest kyst, *abyssicola* er tagen ved Jan Mayen (Lorenz), og *labiata* opføres fra Kola og Novaja Semlja (Smitt).

#### *Mucronella coccinea*, Abildg.

*Discopora appensa*, Smitt (24, IV), p. 27, 175, tab. 27, fig. 177.

*Mucronella coccinea*, Hincks (8), p. 371, tab. 34, fig. 1—6.

**Findested.** St. 290.

Udbredt fra Novaja Semlja til Grønland og fra Spitsbergen til England, Frankrig og Adriaterhavet.

#### *Mucronella sincera*, Smitt.

Tab. I, fig. 13—15.

*Discopora sincera*, Smitt (24, IV), p. 28, 177, tab. 27, fig. 178—180.

„ „ Smitt (26), p. 23.

„ „ Smitt (27), p. 30.

*Lepralia sincera*, Hincks (10), p. 102, tab. 11, fig. 2.

„ „ Lorenz (16), p. 88.

„ „ Hennig (7), p. 357.

*Hemischura sincera*, Busk (\*), p. 237.

? *Mucronella praelucida*, Hincks (9), p. 26, tab. 4, fig. 1.

„ „ Hincks (11), p. 225, tab. 15, fig. 3.

*Mucronella sincera*, Nordgaard (18, I), p. 29, tab. 1, fig. 6.

„ „ Bidekap (1), p. 625.

**Findesteder.** St. 275, 223, 357.

\*) Journ. Linnean Soc., Zool., vol. 15.

in Porsanger Fjord, which gives it a place among the fauna of Norway. The mud-filled cavities of the colonies from Station 357, were partly inhabited by annelids and gephyreans.

### Gen. *Mucronella*.

#### *Mucronella abyssicola*, Norman.

Hincks (8), p. 369; Pl. XXXVIII, figs. 1, 2.

**Occurrence.** St. 48 (on *Retepora*), 223 (on *Myriozoum*), 225, 273.

#### *Mucronella labiata*, Boeck.

*Discopora coccinea* forma *labiata*, Smitt (24, IV), pp. 27, 175; Pl. XXVII, fig. 176.

**Occurrence.** St. 270, 290, 315.

This species occurs very frequently growing upon *Hornera lichenoides*.

Both the last-named species are found in several places on the coast of Norway. *Abyssicola* has been found at Jan Mayen (Lorenz), and *labiata* is recorded from the Kola Peninsula and Novaja Semlja (Smitt).

#### *Mucronella coccinea*, Abildg.

*Discopora appensa*, Smitt (24, IV), pp. 27, 175; Pl. XXVII, fig. 177.

*Mucronella coccinea*, Hincks (8), p. 371; Pl. XXXIV, figs. 1—6.

**Occurrence.** Station 290.

Distributed from Novaja Semlja to Greenland, and from Spitsbergen to England, France and the Adriatic.

#### *Mucronella sincera*, Smitt.

Pl. I, figs. 13—15.

*Discopora sincera*, Smitt (24, IV), pp. 28, 177; Pl. XXVII, figs. 178—180.

„ „ Smitt (26), p. 23.

„ „ Smitt (27), p. 30.

*Lepralia sincera*, Hincks (10), p. 102; Pl. XI, fig. 2.

„ „ Lorenz (16), p. 88.

„ „ Hennig (7), p. 357.

*Hemischura sincera*, Busk (\*), p. 237.

? *Mucronella praelucida*, Hincks (9), p. 26; Pl. IV, fig. 1.

„ „ Hincks (11), p. 225; Pl. XV, fig. 3.

*Mucronella sincera*, Nordgaard (18, I), p. 29; Pl. I, fig. 6.

„ „ Bidekap (1), p. 625.

**Occurrence.** Station 275, 223, 357.

\*) Journ. Linnean Soc., Zool., Vol. XV.

Ligesom de fleste *mucronella*-arter er ogsaa denne underkastet betydelig variation.

Paa høiarktiske eksemplarer kan zoócierne naa en usædvanlig størrelse. Paa en koloni fra St. 223 har jeg saaledes maalt:

Zoóciets længde . . . . .	1.2 mm.
„ bredde . . . . .	0.47 -
Mundingens bredde . . . . .	0.36 -
Aviculariets længde fra mandibelledet . . . . .	0.2 -
„ bredde . . . . .	0.12 -

Lignende maal har jeg taget paa en koloni fra Jøkel-fjord (Kvænangen):

Zoóciets længde . . . . .	1.0 mm.
„ bredde . . . . .	0.42 -
Mundingens bredde . . . . .	0.29 -

Proximalrandens mucro er meget forskjellig i sin udvikling, og munden kan tildels have et *lepralia*-lignende udseende (fig. 15). Zoóciernes væg er i regelen tydelig perforeret. Derimod kan oócierne undertiden give indtryk af at være hele (fig. 13), i andre tilfælde er perforeringen paatagelig (fig. 14). Selv hos kolonier med ganske jevnbrede zoócier har jeg seet tydelige huller i oócierne. Oóciernes form er heller ikke konstant, idet ganske kuglerunde kan veksle med ovale. Avicularierne mangler i regelen, og naar de forekommer sidder et dels paa høire side, dels paa venstre side af munden, eller der kan ogsaa optræde et paa hver side (fig. 14). Mandibelen er but, og avicularierne danner som oftest en ret vinkel med zoóciets længderetning. Hincks (9) har leveret en figur af sin art *Mucronella præluçida*, som leder tanken hen paa *sincera*-arten. Af denne sidste har Hincks muligens kun seet *lepralia*-lignende former (se 10, tab. 11, fig. 3), og da var det naturligt at opstille *præluçida* som en egen art, men har man seet i hvilken grad *M. sincera* kan variere, bliver man tilbøielig til at opfatte *præluçida* som en varietet af denne. „The peculiar projections, placed on each side of the cell“ (Hincks, 11, p. 225) var muligens ikke fuldt udviklede avicularier (se 9, tab. 4, fig. 1), og skulde den formodning være rigtig, faar *præluçida* fra Queen Charlotte Islands en paafaldende lighed med *sincera* fra det nordlige ishav. I ethvertfald er *M. sincera* udbredt fra Novaja Semlja til Grønland, og fra Spitsbergen til Lofoten. Paa min reise vinteren 1899 tog jeg nemlig en koloni ved Digermulen i Raftsundet.

Like most of the *Mucronella* species, this is subject to considerable variation.

In extreme arctic specimens, the zoœcia sometimes attain an unusual size. In one colony, for instance, from Station 223, I have found the following measurements:

Length of zoœcium . . . . .	1.2 mm.
Breadth of zoœcium . . . . .	0.48 -
Breadth of aperture . . . . .	0.36 -
Length of avicularium from mandibular joint . . . . .	0.2 -
Breadth of avicularium . . . . .	0.12 -

I have taken similar measurements from a colony from Jøkel Fjord (Kvænangen):

Length of zoœcium . . . . .	1.0 mm.
Breadth of zoœcium . . . . .	0.42 -
Breadth of aperture . . . . .	0.29 -

The mucro of the proximal margin is very varied in its development, and the mouth has sometimes a *Lepralia*-like appearance (fig. 15). The wall of the zoœcia is generally perforated. The oœcia, on the other hand, sometimes give the impression of being entire (fig. 13); in other cases the perforations are evident (fig. 14). Even in colonies with zoœcia of equal breadth, I have seen distinct holes in the oœcia. Nor is the shape of the oœcia constant, as quite spherical sometimes alternate with oval. The avicularia are generally wanting, and when they occur, are situated on the right, or the left of the aperture, or one may appear on each side (fig. 14). The mandible is not tapering, and the avicularia are generally at right angles to the longitudinal axis of the zoœcium. Hincks (9) has given a figure of this species *Mucronella præluçida* which recalls the *sincera* species. It is possible that Hincks has only seen forms resembling *Lepralia* (see 10, Pl. II, fig. 3), and it would then be natural to make *præluçida* into a special species; but any one who has seen to what an extent *M. sincera* can vary, will be inclined to look upon *præluçida* as one of its varieties. „The peculiar projections, placed on each side of the cell“ (Hincks 11, p. 225), were possibly avicularia that were not fully developed (see 9, Pl. IV, fig. 1); and should this supposition be correct, the *præluçida* from Queen Charlotte Islands acquires a striking resemblance to the *sincera* from the northern polar sea. In any case, *M. sincera* is distributed from Novaja Semlja to Greenland, and from Spitsbergen to Lofoten. While on my journey in the early part of 1899, I found a colony at Digermulen in Raftsund.

### Gen. *Palmicellaria*.

#### *Palmicellaria skenei*, Ell. et Sol.

*Eschara skenei* var. *tridens*, Busk (3), p. 33, fig. 3.

*Cellepora tridens*, Kirchenpauer (Bryozoa, Die Expedition zur physikalisch-chemischen und biologischen Untersuchung der Nordsee im Sommer 1872, p. 188, fig. a, b).

**Findesteder.** St. 290, 223, 323, 363.

### Gen. *Palmicellaria*.

#### *Palmicellaria skenei*, Ell. & Sol.

*Eschara skenei* var. *tridens*, Busk (3), p. 33, fig. 3.

*Cellepora tridens*, Kirchenpauer (Bryozoa, Die Expedition zur physikalisch-chemischen und biologischen Untersuchung der Nordsee im Sommer 1872, p. 188, figs. a, b).

**Occurrence.** St. 290, 223, 323, 363.

Paa samtlige steder var det Busks varietet, som optraadte. Kirchenpauers beskrivelse er baseret paa et eksemplar taget SV for Bukkenfjordens munding. I min fortegnelse (18, I, p. 26) har jeg opført denne art under navnet *porella skenei*, og de eksemplarer, jeg da havde for mig, lignede nærmest Hincks varietet *bicornis* (8, p. 380, tab. 52, fig. 4).

## Fam. Celleporidae.

### Gen. Rhamphostomella.

#### Rhamphostomella costata, Lorenz.

Lorenz (16), p. 94, tab. 7, fig. 11.

**Findesteder.** St. 262, 273.

Arten er desuden omtalt fra St. Lawrence af Hincks (11, p. 426, tab. 21, fig. 6—8), og er funden af mig i Mehavn i Finmarken. Den er rimeligvis ikke saa sparsom i sin forekomst som man efter dette skulde tro, da den uden tvivl af enkelte forfattere har været slaaet sammen med *Rhamphostomella (Cellepora) scabra*.

### Gen. Cellepora.

#### Cellepora ramulosa, Linn.

Hincks (8), p. 401, tab. 52, fig. 7—9.

**Findested.** Korsfjorden, 53 favne.

Er tagen hist og her efter Skandinaviens kyst fra Bohuslän til Finmarken.

#### Cellepora incrassata, Lamarek.

*Celleporaria incrassata*, Smitt (24, IV), p. 33, 198, tab. 28, fig. 212, 213.

*Cellepora cervicornis*, Lorenz (16), p. 95, tab. 1, fig. 12.

*Cellepora ventricosa*, Lorenz (16), p. 96, tab. 1, fig. 13.

**Findesteder.** St. 270, Norskoerne (Spitsbergen).

Arten har stor udbredelse i arktiske have, men gaar ikke saa langt mod syd som til Storbritanien.

In all these places it was Busk's variety that appeared. Kirchenpauer's description is based upon a specimen taken at the SW of the mouth of the Bukken Fjord. In my list (18, I, p. 26), I have entered this species under the name of *Porella skenei*; and the specimens I then had before me, most resembled Hinck's variety *bicornis* (8, p. 380; Pl. LII, fig. 4).

## Fam. Celleporidæ.

### Gen. Rhamphostomella.

#### Rhamphostomella costata, Lorenz.

Lorenz (16), p. 94; Pl. VII, fig. 11.

**Occurrence.** St. 262, 273.

This species is also mentioned from St. Lawrence by Hincks (11, p. 426; Pl. XXI, figs. 6—8), and has been found by me at Mehavn in Finmark. It is probably not so uncommon in its occurrence as this would lead one to believe, as there is no doubt that it has been classed by some authors with *Rhamphostomella (Cellepora) scabra*.

### Gen. Cellepora.

#### Cellepora ramulosa, Linn.

Hincks (8), p. 401; Pl. LII, figs. 7—9.

**Occurrence.** Korsfjord, 53 fathoms.

Is found here and there along the Scandinavian coast from Bohuslän to Finmark.

#### Cellepora incrassata, Lamarek.

*Celleporaria incrassata*, Smitt (24, IV), pp. 33, 198; Pl. XXVIII, figs. 212, 213.

*Cellepora cervicornis*, Lorenz (16), p. 95; Pl. I, fig. 12.

*Cellepora ventricosa*, Lorenz (16), p. 96; Pl. I, fig. 13.

**Occurrence.** St. 270, Norwegian islands (Spitsbergen).

The species is widely distributed in arctic waters, but does not extend so far south as Great Britain.



## Cyclostomata.

### Fam. Crisidae.

#### Gen. Crisia.

##### **Crisia eburnea**, Linn.

*Crisia eburnea*, Smitt (24, I) p. 117, 132, tab. 16, fig. 7—19.

„ „ Hincks (8), p. 420, tab. 56, fig. 5, 6.

*Crisia cornuta*, Smitt (24, I), p. 116, tab. 16, fig. 1.

„ „ Hincks (8), p. 419, tab. 56, fig. 1—4.

**Findesteder.** St. 31, Brandø Sund.

I tilslutning til Hincks har jeg i min fortegnelse (18, II) opført formerne *eburnea* og *cornuta* som særskilte arter. Da der imidlertid mellem de to eksisterer overgangsformer, er det kanske rigtigst at benytte *eburnea* som artsnavn og opføre den anden som *forma cornuta*.

##### **Crisia denticulata**, Lamarek.

Smitt (24, I), p. 117, 137, tab. 16, fig. 20 a, b).

Hincks (8), p. 422, tab. 56, fig. 7—9.

**Findesteder.** St. 10, 164, 223, 262, 273, 323, Porsangerfjord, Spitsbergen.

Denne *crisia* har ogsaa udenfor de arktiske farvand en stor udbredelse.

## Cyclostomata.

### Fam. Crisidæ.

#### Gen. Crisia.

##### **Crisia eburnea**, Linn.

*Crisia eburnea*, Smitt (24, I), pp. 117, 132; Pl. XVI, figs. 7—19.

„ „ Hincks (8), p. 420; Pl. LVI, figs. 5, 6.

*Crisia cornuta*, Smitt (24, I), p. 116; Pl. XVI, fig. 1.

„ „ Hincks (8), p. 419; Pl. LVI, figs. 1—4.

**Occurrence.** Station 31, Brandø Sund.

In my list (18, II), I have followed Hincks in entering the forms *eburnea* and *cornuta* as separate species. As transition forms exist, however, between the two, it will perhaps be best to employ *eburnea* as the specific name, and designate the other as *forma cornuta*.

##### **Crisia denticulata**, Lamarek.

Smitt (24, I), pp. 117, 137; Pl. XVI, fig. 20 a, b).

Hincks (8), p. 422; Pl. LVI, figs. 7—9.

**Occurrence.** St. 10, 164, 223, 262, 273, 323, Porsanger Fjord, Spitsbergen.

This *Crisia* is also widely distributed outside the arctic seas.

## Fam. Tubuliporidae.

## Gen. Tubulipora.

*Tubulipora flabellaris*, Fabr.

Smitt (24, II), p. 401, 455, tab. 9, fig. 6—8.

Harmer (6), p. 99, tab. 8, fig. 4.

**Findested.** St. 366.

Arten er vistnok væsentlig arktisk, men dens udbredelse kan ikke sikkert angives, da den har været forvekslet med andre *tubuliporida*. Se herom Harmer (6).

## Gen. Idmonea.

*Idmonea atlantica*, Forbes.

*Tubulipora atlantica*, Smitt (24, II), p. 398, tab. 3, fig. 6—7, tab. 4, fig. 4—13.

*Idmonea atlantica*, Hincks (8), p. 451, tab. 65, fig. 1—4.

**Findesteder.** St. 223, 273, 286, 290, 323, 363.

Er særlig arktisk i sin forekomst, men er ogsaa ifølge Hincks tagen ved Neapel, Florida, Madeira. Jeg har taget arten paa forskellige steder langs den norske kyst fra Bergen til Finmarken, men har ingensteds fundet den i saa store masser som udenfor Nordkap.

## Gen. Entalophora.

*Entalophora deflexa*, Smitt.

Tab. I, fig. 10, 11.

*Entalophora deflexa*, Smitt (28), p. 11, tab. 5, fig. 28—30.

*Pustulopora deflexa*, Busk, Report on the Polyzoa collected by H. M. S. Challenger, Part 2, p. 20, tab. 4, fig. 3.

**Findesteder.** St. 223, 273, 323, 363.

Smitt (26) har fra Karahavet nævnt en *entalophora*, som blev identificeret med Couch's art *tubulipora deflexa*, hvilken forøvrigt af Hincks er opført som en *stomatopora* (8, p. 437, tab. 57, fig. 4).

Levensen (15) opfører ogsaa fra Karahavet en *entalophora*, men denne blev tydet som *entalophora clavata*, Busk med henvisning til Hincks (8, p. 456).

Samme art er ogsaa af Lorenz (16) angivet som forekommende ved Jan Mayen.

De kolonier, som Nordhavsexpeditionen hjembragte, kan jeg imidlertid ikke faa til at passe med nogen af de nævnte former. Derimod stemmer dens udseende temmelig godt med Smitts beskrivelse og tegninger af *entalophora*

## Fam. Tubuliporidae.

## Gen. Tubulipora.

*Tubulipora flabellaris*, Fabr.

Smitt (24, II), pp. 401, 455; Pl. IX, figs. 6—8.

Harmer (6), p. 99; Pl. VIII, fig. 4.

**Occurrence.** Station 366.

This species, it is true, is principally arctic, but its distribution cannot be certainly stated, as it has been confounded with other *Tubuliporidae*. Vide Harmer (6) on the subject.

## Gen. Idmonea.

*Idmonea atlantica*, Forbes.

*Tubulipora atlantica*, Smitt (24, II), p. 398; Pl. III, figs. 6, 7; Pl. IV, figs. 4—13.

*Idmonea atlantica*, Hincks (8), p. 451; Pl. LXV, figs. 1—4.

**Occurrence.** St. 223, 273, 286, 290, 323, 363.

Is especially arctic in its occurrence, but according to Hincks, is also found at Naples, and in Florida and Madeira. I have taken the species in various places along the Norwegian coast from Bergen to Finmark, but have found it nowhere in such great numbers as off the North Cape.

## Gen. Entalophora.

*Entalophora deflexa*, Smitt.

Pl. I, figs. 10, 11.

*Entalophora deflexa*, Smitt (28), p. 11; Pl. V, figs. 28—30.

*Pustulopora deflexa*, Busk, Report on the Polyzoa collected by H. M. S. Challenger, Part II, p. 20; Pl. IV, fig. 3.

**Occurrence.** St. 223, 273, 323, 363.

Smitt (26) mentions an *Entalophora* from the Kara Sea, which was identified with Couch's species *Tubulipora deflexa*, which, moreover, is classed by Hincks as a *Stomatopora* (8, p. 437; Pl. LVII, fig. 4).

Levensen (15) also gives an *Entalophora* from the Kara Sea, but this is designated *Entalophora clavata*, Busk, with a reference to Hincks (8, p. 456).

The same species is also mentioned by Lorenz (16) as occurring off Jan Mayen.

I cannot, however, make the colonies brought home by the North Atlantic Expedition agree with any of the above-mentioned forms. On the other hand, their appearance agrees fairly well with Smitt's description and draw-

*deflexa* i Floridan Bryozoa, og jeg maa antage, at det virkelig er denne art, som har foreligget. Enhver, som har beskæftiget sig noget med cyclostomate polyzoer, ved hvilke store vanskeligheder ofte er forbundet med at identificere dem, og man tør neppe stole sikkert paa, at den arktiske fauna omfatter baade *entalophora deflexa* og *clavata* samt desuden *stomatopora deflexa*, Couch.

Det, som især synes at karakterisere *entalophora deflexa*, er den betydelige længde af zoóciernes frie del, jeg har nemlig fundet den af være 0.84—0.96 mm., stundom endog 1.2 mm. Længden er nemlig ogsaa underkastet betydelig variation. Zoóciernes tykkelse i den frie del fandtes at variere mellem 0.14—0.18 mm.

Oócier har jeg ikke fundet, men Smitt har tegnet dem som en opsvulmning under bifurcationen.

### Gen. *Reticulipora*.

#### *Reticulipora intricaria*, Smitt.

Tab. I, fig. 12.

*Reticulipora intricaria*, Smitt (24, V), p. 1117, tab. 20, fig. 1—3.

*Diastopora intricaria*, Levinsen (15), p. 21.

*Reticulipora intricaria*, Nordgaard (18, II), p. 5.

**Findesteder.** St 48, 290, 315.

Af de her opførte Stationer ligger 48 i øst for Island, 290 og 315 mellem Norge og Spitsbergen. Paa dette strøg er arten tagen engang før, nemlig af den svenske Spitsbergexpedition (Smitt). Lindahl har taget den i Baffin's Bay, og Dijnphnaexpeditionen i Karahavet (Levinson). Endelig har jeg fundet den ved Sværholt i Finmarken.

Smitt (l. c.) har tydelig fremhævet slægtskabet med *diastopora* specielt *obelia* ved tilstedeværelsen af smaarør, tilslutning af de ældre zoócier ved en kalklamel, o. s. v. Denne kalklamel (operculum) er ogsaa her perforeret. De kolonier jeg havde til undersøgelse, afgav nok et vidnesbyrd om nært slægtskab med *diastopora*, idet der i grenenes kant forekom et listeagtigt fremspring svarende til basal-skivens udvidelse hos *diastopora* (the marginal extension of the basal lamina).

Længden af den frie del af zoócierne ved 0.4—0.6 mm. og tykkelsen ca. 0.12 mm.

ings of *Entalophora deflexa* in Floridan Bryozoa; and I may assume that it really is this species that I have had before me. Any one who has had anything to do with cyclostomatous polyzoans, knows the great difficulties that are frequently connected with their identification; and one dare hardly be sure that the arctic fauna includes both *Entalophora deflexa* and *clavata*, as well as *Stomatopora deflexa*, Couch.

That which seems especially to characterise *Entalophora deflexa*, is the considerable length of the free portion of the zoëcia. I have found it to be 0.84—0.96 mm., sometimes as much as 1.2 mm. The length, too, is subject to considerable variation. The thickness of the zoëcia in their free part was found to vary between 0.14 and 0.18 mm.

I have not found any oëcia, but Smitt has drawn them as a swelling below the bifurcation.

### Gen. *Reticulipora*.

#### *Reticulipora intricaria*, Smitt

Pl. I, fig. 12.

*Reticulipora intricaria*, Smitt (24, V), p. 1117; Pl. XX, figs. 1—3.

*Diastopora intricaria*, Levinsen (15), p. 21.

*Reticulipora intricaria*, Nordgaard (18, II), p. 5.

**Occurrence.** St. 48, 290, 315.

Of the above-mentioned stations, 48 lies east of Iceland, and 290 and 315 between Norway and Spitsbergen. The species has been taken once before in this district, namely, by the Swedish Spitsbergen Expedition (Smitt). Lindahl has found it in Baffin's Bay, and the Dijnphna Expedition in the Kara Sea (Levinson). Lastly, I have found it at Sværholt in Finmark.

Smitt (l. c.) has clearly pointed out the relationship to *Diastopora*, especially *obelia*, in the presence of small tubes, the closing of the older zoëcia by a calcareous lamella, etc. This calcareous lamella (operculum) is perforated here too. The colonies I examined possessed yet another proof of their near relationship to *Diastopora*, in the occurrence of a fillet-like projection at the edge of the branches, corresponding to the extension of the basal lamina in *Diastopora*.

The length of the free portion of the zoëcia was from 0.4 to 0.6 mm., and its thickness about 0.12.



## Fam. Horneridae.

## Gen. Hornera.

**Hornera lichenoides** (Pontopidan), Linn.

Smitt (24, II), p. 404, tab. 7, fig. 1—14.

Hincks (8), p. 468, tab. 67, fig. 1—5.

**Findesteder.** St. 223, 273, 275, 290, 315, 337.

Paa st. 275 forekom den robuste varietet. Er særlig arktisk, men gaar sydover til Bohuslän, Shetland og Hebriderne.

## Fam. Lichenoporidae.

## Gen. Lichenopora.

**Lichenopora hispida**, Flem.*Discoporella hispida*, Smitt (24, II), p. 406, 483, tab. 11, fig. 10—12.*Lichenopora hispida*, Hincks (8), p. 473, tab. 68, fig. 1—8.**Findested.** St. 337.

Udbredt fra Norge til Frankrige.

**Lichenopora verrucaria**, Fabr.*Discoporella verrucaria*, Smitt (24, II), p. 405, 479, tab. 10, fig. 6—8.*Lichenopora verrucaria*, Hincks (8), p. 478, tab. 64, fig. 4—5.

" " Harmer (5), tab. 7, fig. 1—9.

**Findested.** St. 366 (paa alger).

Udhredt fra Spitsbergen til England og fra Karahavet til Grønland.

## Gen. Defrancia.

**Defrancia lucernaria**, M. Sars.

Tab. I, fig. 16—17.

*Tubulipora lucernaria*, M. Sars (22), p. 145.*Defrancia lucernaria*, M. Sars (23), g. 164.

" " Smitt (24, II), p. 408, 493.

" *truncata*, Busk (3), p. 35, tab. 1, fig. 8." *lucernaria*, Busk (2, Part 3), p. 36, tab. 33, fig. 3.*Domopora stellata*, Lorenz (16), p. 99." *lucernaria*, Levinsen (15), p. 22 (sep.).

## Fam. Horneridæ.

## Gen. Hornera.

**Hornera lichenoides** (Pontopidan), Linn.

Smitt (24, II), p. 404; Pl. VII, figs. 1—14.

Hincks (8), p. 468; Pl. LXVII, figs. 1—5.

**Occurrence.** St. 223, 273, 275, 290, 315, 337.

The robust variety occurred at Station 275. Is distinctly arctic, but is found southwards as far as Bohuslän, the Shetlands, and the Hebrides.

## Fam. Lichenoporidae.

## Gen. Lichenopora.

**Lichenopora hispida**, Flem.*Discoporella hispida*, Smitt (24, II), pp. 406, 483; Pl. XI, figs. 10—12.*Lichenopora hispida*, Hincks (8), p. 473; Pl. LXVIII, figs. 1—8.**Occurrence.** Station 337.

Distributed from Norway to France.

**Lichenopora verrucaria**, Fabr.*Discoporella verrucaria*, Smitt (24, II), pp. 405, 479; Pl. X, figs. 6—8.*Lichenopora verrucaria*, Hincks (8), p. 478; Pl. LXIV, figs. 4, 5.

" " Harmer (5), Pl. VII, figs. 1—9.

**Occurrence.** Station 366 (on algæ).

Distributed from Spitsbergen to England, and from the Kara Sea to Greenland.

## Gen. Defrancia.

**Defrancia lucernaria**, M. Sars.

Pl. I, figs. 16, 17.

*Tubulipora lucernaria*, M. Sars (22), p. 145.*Defrancia lucernaria*, M. Sars (23), p. 164.

" " Smitt (24, II), pp. 408, 493.

" *truncata*, Busk (3), p. 35; Pl. I, fig. 8." *lucernaria*, Busk (2, Part 3), p. 36; Pl. XXXIII, fig. 3.*Domopora stellata*, Lorenz (16), p. 99." *lucernaria*, Levinsen (15), p. 22.

**Findesteder.** St. 267, 290, 323, 357, 363. Porsangerfjorden.

Denne art opdagedes først af M. Sars paa hans reise til Lofoten og Finmarken i 1849. I hans herom afgivne beretning blev den kortelig beskrevet under navnet *tubulipora lucernaria*. Den gjenfandtes ved Finmarken i 1856 af M'Andrew, og Busk identificerede den feilagtig med Jamesons art *domopora truncata*. Senere er arten udførligere beskrevet af M. Sars (23) og Smitt (24, II).

Lorenz (16, p. 99) opfører *domopora stellata*, Goldfuss fra Jan Mayen, men udtrykket „durch einen besonders dünnen Stiel ausgezeichnet“ vidner om, at det er *defrancia lucernaria*, som har foreligget. (Jan Mayen som findested for *domopora stellata* bør saaledes udgaa).

*Defrancia lucernaria* har efter dette følgende udbredelse: Karahavet, Kola, Spitsbergen, Grønland (Levinsen, Smitt), Jan Mayen (Lorenz), nordlige Norge (M. Sars). I Norge har Sars taget nævnte art ved Vadsø, i Komagfjord og Øxfjord (Finmarken), ved Beian (Trondhjemsfjorden), samt i Kristianiafjorden et forkroblet eksemplar. Aurivillius omtaler den fra Kvænangen, og jeg har vinteren 1899 taget den paa forskjellige steder fra Lofoten til Porsangerfjorden. Jeg sætter foreløbig Lofoten som artens sydgrænse ved vor kyst; thi det ene (muligens ogsaa subfossile eksemplar), som M. Sars tog ved Vallø i Kristianiafjorden kan ikke berettigge til at flytte udbredelsesgrænsen did. Ved Beian er den heller ikke gjenfundet siden Sars's dage. Et interessant faktum er det imidlertid, at denne udpræget arktiske form i dette aarhundrede er observeret baade i Trondhjems- og Kristianiafjorden. For at levere et billede af de fysiske forhold, hvorunder *defrancia lucernaria* lever, vil jeg opføre dybde, temperatur og saltgehalt paa endel af de steder, hvor arten observeredes paa min reise vinteren 1899, samt paa Nordhavexpeditionens stationer.

1899	Sted	Dybde	Temp.	Saltgehalt
3die mars	Kirkfjorden . . . (Moskenesø)	50 m.	2.5 <sup>0</sup> C.	33.40 ‰
19de april	Kvænangen . . .	90 -	0.75 <sup>0</sup> -	34.21 -
21de „	Jøkelfjord . . .	90 -	1.4 <sup>0</sup> -	34.35 -
27de „	Porsangerfjord . .	200 -	0.2 <sup>0</sup> -	34.48 -

**Occurrence.** St. 267, 290, 323, 357, 363, Porsanger Fjord.

This species was first discovered by M. Sars on his journey through Lofoten and Finmark in 1849. In his report, it was briefly described under the name *Tubulipora lucernaria*. It was found again in Finmark, in 1856, by M'Andrew, and Busk identified it erroneously with Jameson's species *Domopora truncata*. The species was subsequently described at greater length by M. Sars (23) and Smitt (24, II).

Lorenz (16, p. 99) records *Domopora stellata*, Goldfuss, from Jan Mayen, but the expression „durch einen besonders dünnen Stiel ausgezeichnet“, shows that it has been *Defrancia lucernaria*. (Jan Mayen ought therefore to be omitted from the list of places where *Domopora stellata* is found).

According to this, *Defrancia lucernaria* has the following distribution: the Kara Sea, the Kola Peninsula, Spitsbergen, Greenland (Levinsen, Smitt), Jan Mayen (Lorenz), the north of Norway (M. Sars). Sars has found the species in Norway, at Vadsø, in the Komagfjord and Oxfjord (Finmark), at Beian (Trondhjem Fjord), and a deformed specimen in the Kristiania Fjord. Aurivillius mentions it from Kvænangen, and I found it in the early part of 1899 in various places from Lofoten to Porsanger Fjord. In the mean time, I would set Lofoten as the southern limit of the species on our coast; for the single (possibly also subfossilised) specimen found by M. Sars at Vallø in the Kristiania Fjord, does not justify the removal of the distribution limit thither. Nor has it been found again at Beian since Sars's day. It is, however, an interesting fact that this peculiarly arctic form has been observed during this century both in the Trondhjem and Kristiania Fjords. In order to give a representation of the physical conditions in which *Defrancia lucernaria* lives, I will give the depth, temperature and salinity at some of the places where the species was observed during my journey at the beginning of 1899, and at the North Atlantic Expedition Stations.

1899	Place	Depth	Temperature	Salinity
March 3	Kirkfjord . . . (Moskenesø)	50 m.	2.5 <sup>0</sup> C.	33.40 ‰
April 19	Kvænangen . . .	90 -	0.75 <sup>0</sup> -	34.21 -
„ 21	Jøkelfjord . . .	90 -	1.4 <sup>0</sup> -	34.35 -
„ 27	Porsanger Fjord .	200 -	0.2 <sup>0</sup> -	34.48 -

For Nordhavsexpeditionenens findesteder stiller naturforholdene sig saaledes:

Station	Dybde	Temperatur
267	271 m.	$\div$ 1.4° C.
290	349 -	3.5° -
323	408 -	1.5° -
357	229 -	1.9° -
363	475 -	1.1° -

With regard to the North Atlantic Expedition, the natural conditions in the places of occurrence are as follows:

Station	Depth	Temperature
267	271 m.	$-$ 1.4° C.
290	349 -	3.5° -
323	408 -	1.5° -
357	229 -	1.9° -
363	475 -	1.1° -



## Ctenostomata.

### Fam. Alcyonidiidae.

#### Gen. Alcyonidium.

##### *Alcyonidium gelatinosum*, Linn.

Hincks (8), p. 491, tab. 69, fig. 1—3.

Levinsen (14), p. 80, tab. 7, fig. 21—28.

**Findesteder.** Østhavet (sandsynligvis St. 322), St. 260, 363.

Udbredt fra Spitsbergen til Kanalen og fra Novaja Semlja til Grønland.

##### *Alcyonidium disciforme*, Smitt.

*Alcyonidium mamillatum*, var. *disciforme*, Smitt (24, V), p. 1123, tab. 20, fig. 9.

*Alcyonidium disciforme*, Levinsen (15), p. 23, tab. 27, fig. 13.

„ „ Smitt (26), p. 11.

„ „ Bidekap (1), p. 633.

**Findesteder.** St. 267, 323.

Denne eiendommelige *alcyonidium* er før funden i Karahavet (Levinsen, Smitt), mellem Norge og Spitsbergen (Smitt), samt ved Østspitsbergen (Bidekap). Paa min ekspedition vinteren 1899 tog jeg desuden 3 eksemplarer i Lyngenfjorden (320 m., lerbund, temp. 3.65° C., saltgeh. 34.84 ‰). Arten blir saaledes ogsaa at henhøre til Norges fauna.

De eksemplarer, hvorpaa Smitts beskrivelse baseredes, var skiveformede, mens de, som Levinsen og Bidekap

## Ctenostomata.

### Fam. Alcyonidiidæ.

#### Gen. Alcyonidium.

##### *Alcyonidium gelatinosum*, Linn.

Hincks (8), p. 491; Pl. LXIX, figs. 1—3.

Levinsen (14), p. 80; Pl. VII, figs. 21—28.

**Occurrence.** The Barents Sea (probably Station 322), St. 260, 363.

Distributed from Spitsbergen to the English Channel, and from Novaja Semlja to Greenland.

##### *Alcyonidium disciforme*, Smitt.

*Alcyonidium mammillatum* var. *disciforme*, Smitt (24, V), p. 1123; Pl. XX, fig. 9.

*Alcyonidium disciforme*, Levinsen (15), p. 23; Pl. XXVII, fig. 13.

„ „ Smitt (26), p. 11.

„ „ Bidekap (1), p. 633.

**Occurrence.** St. 267, 323.

This characteristic *Alcyonidium* has been found in the Kara Sea (Levinsen, Smitt), between Norway and Spitsbergen (Smitt), and at Eastern Spitsbergen (Bidekap). During my expedition in the early part of 1899, I also found 3 specimens in the Lyngen Fjord (depth 320 m., clay bottom, temperature 3.65° C., salinity 34.84 ‰). The species may thus also be classed among the fauna of Norway.

The specimens upon which Smitt's description was based, were disc-shaped, while those that Levinsen and

havde til undersøgelse, dannede flade ringe. Fra St. 323 havde jeg flere kolonier, hvoraf enkelte dannede en skive, andre en flad ring, og atter andre havde form af en liden hætte. Paa St. 267 samt i Lyngenfjorden forekom de ogsaa dels i ring, dels i skiveform. Hidtil er altsaa *A. disciforme* kun funden i den østlige del af Ishavet.

Blandt Nordhavsexpeditionens materiale fandtes ogsaa en liden koloni af *rabdopleura* (fra St. 10), men den var saa daarlig konserveret, at man intet væsentligt kunde se paa den. Det eneste, som saaledes kan konstateres, er alene forekomsten paa nævnte sted.

Selv om man til Norges fauna henfører alt, som findes indenfor territorialgrænsen (4 kv.mil fra land), blir der dog 3—4 arter i foranstaaende fortegnelse, som ialfald foreløbig ikke kan medregnes til vor fauna. Disse er, *menipea normani*, *membranipora spitsbergensis*, *entalophora deflexa* og sandsynligvis *membranipora cornigera*. Forøvrigt kan bemærkes, at fortsatte undersøgelser i fjordene nordpaa ganske sikkert vil fremdrage en og anden form, som er funden ved Spitsbergen f. eks., men ikke i Finmarken. Efter en løs mønstring af det materiale, som jeg medbragte fra min vinterekspedition 1899, har jeg for faunaen indvundet to nye og eiendommelige polyzoformer, nemlig *smittia trispinosa* var. *arborea* og *alcyonidium disciforme*. Den første fra Porsanger-, den anden fra Lyngenfjorden. Efter de hydrografiske undersøgelser, som jeg fik anledning til at anstille, finder jeg det heller ikke paafaldende, at høiarktiske polyzoer forekommer i de nordlige fjorde. I Porsangerfjorden mellem store og lille Tamsø fandtes saaledes 27de april 1899 paa bunden i 200 meters dyb en temperatur 0.2° C. og saltgehalt 34.48 ‰. Paa dette sted tog jeg *smittia trispinosa* var. *arborea*. I Lyngenfjordens ytre del maalte jeg 3die mai 1899 i 320 meters dyb (bund) temperaturen 3.65° C. Saltgehalten fandtes senere ved titrering at være 34.84 ‰. Her forekom blandt andet ogsaa *alcyonidium disciforme*. I Jøkelfjorden (arm af Kvænangen) var den 20de april 1899 i 80 meters dyb temp. 0.9° C., saltgeh. 34.29 ‰. Her tog jeg diverse arktiske polyzoer saasom *myrionozoum crustaceum*, *mucronella sincera*, *rhamphostomella scabra*, *defrancia lucernaria*, etc. Imidlertid vil jeg her ikke gaa nærmere ind paa den hydrografiske side af sagen, jeg vil kun nævne at det voksende kjendskab til fjordenes og havkystens hydrografi utvilsomt vil bidrage til løsningen af adskillige zoogeografiske spørgsmål.

Hincks (8) opfører 235 arter af polyzoer for den britiske fauna og for 28 af disse er Shetland den eneste britiske lokalitet. Af de 28 var 8 ikke funden udenfor Shet-

Bidenkap examined were in the form of flat rings. I had several colonies from Station 323, in which some were in the form of a disc, others of a flat ring, while others again were in the form of a little cowl. At Station 267 and in the Lyngen Fjord, too, they occurred partly in the shape of rings, partly discoidal. *A. disciforme* has thus hitherto only been found in the eastern part of the Polar Sea.

A little colony of *Rabdopleura* (from Station 10) was also in the North Atlantic Expedition collection; but it was in such a bad state of preservation, that nothing of any consequence could be seen in it. The only thing that can be proved is its occurrence in the above-named place.

Even if all that are found within four miles of the shore, were to be referred to Norway's fauna, there would still be 3 or 4 species in the above list, that for the present, at any rate, cannot be reckoned among our fauna. These are *Menipea normani*, *Membranipora spitsbergensis*, *Entalophora deflexa*, and probably *Membranipora cornigera*. It may be further remarked that continued investigations of the northern fjords will certainly bring to light some form or other that is found, for instance, in Spitsbergen, but not in Finmark. After a casual review of the collection that I brought back from my expedition in 1899, I find that I have added two new and characteristic forms of Polyzoa to the fauna, namely, *Smittia trispinosa* var. *arborea* and *Alcyonidium disciforme*, the first from Porsanger, the second from Lyngen Fjord. After the hydrographic investigations that I was enabled to prosecute, I do not consider it at all remarkable that extreme arctic Polyzoa should occur in the fjords of the north. In the Porsanger Fjord, between Great and Little Tamsø, for instance, there was found, on April 27th, 1899, on the bottom at a depth of 200 metres, a temperature of 0.2° C., and salinity 34.48 ‰. At this spot I found *Smittia trispinosa* var. *arborea*. In the lower part of Lyngen Fjord, on May 3rd, 1899, I found on the bottom, at a depth of 320 metres, a temperature of 3.65° C. The salinity was subsequently found by titration to be 34.84 ‰. *Alcyonidium disciforme* occurred here, among others. In Jøkelfjorden, an arm of Kvænangen, on April 20th, 1899, at a depth of 80 metres, the temperature was 0.9° C., the salinity 34.29 ‰. Here I found various arctic Polyzoa, such as *Myrionozoum crustaceum*, *Mucronella sincera*, *Rhamphostomella scabra*, *Defrancia lucernaria*, etc. I shall not, however, go further into the hydrographical side of the question here. I will only remark that the increasing knowledge of the hydrography of the fjords and coast will contribute to the solution of various zoogeographical questions.

Hincks (8) puts down 235 species of Polyzoa as belonging to the British fauna, and for 28 of these the Shetland Isles is the only locality. Eight of these 28 were

land, og de resterende 20, som næsten alle er arktiske former, har her fundet sin sydgrænse. Den engelske polyzoafauna omfatter omtrent dobbelt saa mange arter som den norske, der er endvidere et betydeligt fællesskab i former baade af boreal og arktisk natur, men der gives dog adskillige norske arter, som ikke forekommer ved Storbritanniens kyster. Disse er for den allerstørste del af ren arktisk karakter. Af saadanne har jeg hidtil merket mig følgende:

*Menipea normani*, Nordg.  
*Kinetoskias smittii*, Dan. & Koren.  
 „ *arborescens*, Dan. & Koren.  
*Flustra membranaceo-truncata*, Smitt.  
 „ *abyssicola*, M. Sars.  
*Membranipora cymbæformis*, Hincks.  
 „ *arctica*, D'Orb.  
*Cribrilina nitido-punctata*, Smitt.  
 „ *scutulata*, Busk.  
*Myriozeugum crustaceum*, Smitt.  
 „ *coarctatum*, M. Sars.  
*Lepralia spathulifera*, Smitt.  
*Porella elegantula*, D'Orb.  
 „ *proboscidea*, Hincks.  
*Escharoides sarsii*, Smitt.  
*Smittia porifera*, Smitt.  
 „ *arctica*, Norman.  
 „ *lineata*, Nordg.  
 „ *reticulato-punctata*, Hincks.  
 „ *propinqua*, Smitt.  
 „ *palmata*, M. Sars.  
 „ *trispinosa* var. *arborea*, Levinsen.  
*Mucronella (lepralia)*, *cruenta*, Norman.  
 „ *labiata*, Boeck.  
 „ *sincera*, Smitt.  
*Retepora cellulosa*, Linn.  
 „ *elongata*, Smitt.  
*Rhamphostomella scabra*, Fabr.  
 „ *costata*, Lorenz.  
 „ *plicata*, Smitt.  
*Cellepora nodulosa*, Lorenz.  
 „ *incrassata*, Lamarck.  
*Reticulipora intricaria*, Smitt.  
*Defrancia lucernaria*, M. Sars.  
*Alcyonidium disciforme*, Smitt.

En flerbred af de her opførte er ikke ved vor kyst observeret søndenfor polarcirklen, men der gives ogsaa enkelte, som forekommer søndenfor denne, men alligevel er utvivlsomt arktiske. En saadan er f. eks. *Kinetoskias arborescens*. Den er funden i Karahavet paa 20—58 favne (Levinsen), i Wijdebay paa Spitsbergen i 40 favne (Smitt), endvidere har Danielsen taget den ved Vadsø, 90 favne. Naar saa Nordhavsexpeditionen tog den samme art paa et dyb af 672 favne i Sognefjorden, maa det være et eksempel blandt flere paa, at en arktisk form har holdt sig gjennem

Den norske Nordhavsexpedition. O. Nordgaard: Polyzoa.

not found out of the Shetlands, and the remaining 20, which were nearly all arctic forms, had their southern limit there. The British polyzoan fauna comprises about twice as many species as the Norwegian. They have moreover, a considerable number of forms in common, but there are also a good many Norwegian species that do not occur on the shores of Great Britain. By far the greater number of these are of a purely arctic character. Of these, I have up to the present noted the following:

*Menipea normani*, Nordg.  
*Kinetoskias smittii*, Dan. & Koren.  
 „ *arborescens*, Dan. & Koren.  
*Flustra membranaceo-truncata*, Smitt.  
 „ *abyssicola*, M. Sars.  
*Membranipora cymbæformis*, Hincks.  
 „ *arctica*, D'Orb.  
*Cribrilina nitido-punctata*, Smitt.  
 „ *scutulata*, Busk.  
*Myriozeugum crustaceum*, Smitt.  
 „ *coarctatum*, M. Sars.  
*Lepralia spathulifera*, Smitt.  
*Porella elegantula*, D'Orb.  
 „ *proboscidea*, Hincks.  
*Escharoides sarsii*, Smitt.  
*Smittia porifera*, Smitt.  
 „ *arctica*, Norman.  
 „ *lineata*, Nordg.  
 „ *reticulato-punctata*, Hincks.  
 „ *propinqua*, Smitt.  
 „ *palmata*, M. Sars.  
 „ *trispinosa* var. *arborea*, Levinsen.  
*Mucronella (lepralia)*, *cruenta*, Norman.  
 „ *labiata*, Boeck.  
 „ *sincera*, Smitt.  
*Retepora cellulosa*, Linn.  
 „ *elongata*, Smitt.  
*Rhamphostomella scabra*, Fabr.  
 „ *costata*, Lorenz.  
 „ *plicata*, Smitt.  
*Cellepora nodulosa*, Lorenz.  
 „ *incrassata*, Lamarck.  
*Reticulipora intricaria*, Smitt.  
*Defrancia lucernaria*, M. Sars.  
*Alcyonidium disciforme*, Smitt.

The majority of the species in this list have not been observed on our coast south of the arctic circle; but there are also a few that do occur south of this, but are nevertheless undoubtedly arctic. *Kinetoskias arborescens* is one of these. It was found in the Kara Sea in depths of 20—58 fathoms (Levinsen), in Wijde Bay in Spitsbergen, at a depth of 40 fathoms (Smitt), and Danielsen has found it at Vadsø, 90 fathoms. That the North Atlantic Expedition found the same species at a depth of 672 fathoms in the Sognefjord, must be taken as one instance among



de skiftende tider paa de store dyb i vore fjorde. Disse fjorddyb udmerker sig ved en stor stabilitet i de fysiske forhold. Temperaturen er 6—7° C. og saltgehaltens 35 ‰ eller lidt over. Det ligger da nær at antage, at saadanne forhold ogsaa maa egne sig vel for former af sydlig oprindelse. Selv saa langt mod nord som i Vestfjordens dybbassin har G. O. Sars fundet bundfaunaen at være væsentlig sydlig, mens nævnte fjords littoralfauna havde et arktisk præg. Littoralfaunaens større afhængighed af den geografiske bredde bunder sandsynligvis i hydrografiske forhold, idet vandlaget fra 0—200 à 250 meter staar under direkte indflydelse af de meteorologiske faktoreres aarlige variation.

I Vestfjordens største dyb (Tranødybet) tog jeg 16de marts 1899 ved trawling i en dybde af en dybde af ca. 600 meter 3 eksemplarer af *Kinetoskias smittii*. Temperaturen var 6.3° C., saltgehaltens 35.06 ‰, den aarlige forandring er for intet at regne. *Kinetoskias arborescens* i Sognefjorden, og *smittii* i Vestfjorden levede saaledes under omtrent de samme hydrografiske forhold, men det er aabenbart stor forskjel paa deres zoogeografiske karakter. Den første er arktisk, og den maa i Sognefjorden betragtes som en relict form, mens *Kinetoskias smittii* baade af andre og af mig er taget i en flerhed af eksemplarer i de vestlandske fjorde, Trondhjemsfjorden, o. s. v., men den er ikke taget i egentlig arktiske farvand, folgelig maa den være boreal og ved sin optræden i Vestfjorden, Tysfjorden etc. betegnes som en sydlig emigrant. Denne betegnelse kan uden tvil ogsaa anvendes paa *Bicellaria alderi* ved dens forekomst paa St. 315 (74° 53' N. Br.). Havde Golfstrømmen ikke været, vilde visselig ogsaa denne polyzo have manglet paa dette sted. Derimod er *Flustra abyssicola* en arktisk og gammel form, sandsynligvis den ældste af de recente flustraer.

Den norske polyzoverdens stærkt arktiske karakter giver sig blandt andet tydeligt tilkjende ved sammenligning med Grønlands. At Vanhöffens fortegnelse\*) (30, p. 233) har jeg noteret følgende, som endnu ikke er fundne ved norsk kyst:

*Cellaria articulata*, Fabr.  
*Flustra serrulata*, Busk.  
*Schizoporella biaperta*, Michelin.  
*Hippothoa expansa*, Dawson.  
*Porella acutirostris*, Smitt.  
 „ *perpusilla*, Busk.  
*Cellepora whiteavesi*, Norman.  
*Stomatopora penicillata*, Fabr.  
 „ *diastoporoides*, Norman.

\*) Denne fortegnelse er, saavidt jeg kan forstaa, meget fuldstændig. Idetmindste én art er dog udeglemt, nemlig *Cribrilina scutulata*, Busk.

many of an arctic form having remained through changing periods in the great depths in our fjords. These fjord-depths are remarkable for a great stability in their physical conditions. The temperature is 6° or 7° C., and the salinity 35 ‰ or a little more. It is then natural to suppose that such conditions must also be well adapted for forms of southern origin. This, too, has proved to be the case. Even as far north as in the deep basin of the Vestfjord, G. O. Sars has found the bottom fauna to be essentially southern, while the littoral fauna of the same fjord was arctic in character. The great dependence of the littoral fauna upon the geographical latitude, probably rests upon hydrographical conditions, as the water-stratum from 0 to 200 or 250 metres. is under the direct influence of the annual variations of the meteorological factors.

In the Vestfjord's greatest depth (Tranø depth), on March 16th, 1899, I caught, when trawling in a depth of about 600 metres, 3 specimens of *Kinetoskias smittii*. The temperature was 6.3° C., the salinity 35.06 ‰, the annual variation cannot be reckoned as anything. Thus *Kinetoskias arborescens* in the Sognefjord, and *smittii* in the Vestfjord, lived under almost the same hydrographical conditions; but there is evidently a great difference between their zoögeographical characters. The first is arctic, and in the Sognefjord it must be regarded as a relict form; while a number of specimens of *Kinetoskias smittii* have been found by myself and others in the west-country fjords, the Trondhjem Fjord, etc., but it has not been found in truly arctic waters. It must therefore be boreal, and in its appearance in the Vestfjord, Tysfjord etc., be designated a southern emigrant. This designation may also without doubt be used for *Bicellaria alderi*, from its occurrence at Station 315 (74° 53' N. Lat.). Had there been no Gulf Stream, this polyzoan would certainly not have been found in this place. On the other hand, *Flustra abyssicola* is arctic, and an early form, probably the earliest of the recent *Flustra* species.

The extremely arctic character of the Norwegian Polyzoa is clearly seen, among other things, by a comparison with that of Greenland. I have noted down the following species from Vanhöffen's list\*) (30, p. 233), which have not been found on the Norwegian coast:

*Cellaria articulata*, Fabr.  
*Flustra serrulata*, Busk.  
*Schizoporella biaperta*, Michelin.  
*Hippothoa expansa*, Dawson.  
*Porella acutirostris*, Smitt.  
 „ *perpusilla*, Busk.  
*Cellepora whiteavesi*, Norman.  
*Stomatopora penicillata*, Fabr.  
 „ *diastoporoides*, Norman.

\*) As far as I am able to judge, this list is very complete, but one species at least, has been omitted, namely, *Cribrilina scutulata*, Busk.

*Diastopora maeandrina*, Wood.

*Bowerbankia arctica*, Busk.

*Buskia nitens*, Alder.

Disse udgjør omtrent 14 pct. af samtlige arter i fortegnelsen. Størsteparten af de ovenfor anførte arter er heller ikke observeret ved Spitsbergen eller i Karahavet.

Af de 7 arktiske former, som forekommer ved Queen Charlotte Islands men ikke ved britiske kyster er den kun én nemlig *Cellaria articulata*, som endnu ikke er indlemmet i vor fauna. De øvrige 6 (*Flustra membranaceo-truncata*, *Membranipora arctica*, *Myrionozoum coarctatum*, *Rhamphostomella plicata*, *Cellepora incrassata*, *Retepora elongata*) er vel kjendte fra vor arktiske region.

Da jeg sommeren 1894 udenfor Nordkyn i Finmarken tog op en *Laminaria hyperborea*, som fra grunden til toppen (70 cm.) var tæt besat med *Gemellaria loricata* i yppig vekst, blev jeg slaaet over denne tydelige tilkjenningelse af livskraft. Paa min reise forleden vinter havde jeg anledning til at skrabe noget i trange og strømsterke sund i Finmarken, og det viste sig ogsaa der, at enkelte arter som *Gemellaria*, *Menipea*, etc. havde en enestaaende kraftig vekst. Studiet af polyzoerne bekræfter saaledes det almindelige indtryk, at arktiske dyr i regelen er kraftige og velfødte. Med andre ord, arktiske former viser overlegenhed i størrelse og udvikling i det hele taget fremfor sin nære slegtninge blandt de boreale dyr. Dr. Pfeffer\*) udtaler ogsaa om polyzoerne: „Sie fehlen nirgends völlig, sind aber in den Tropen und den grossen Tiefen sparsamer, dagegen in den kälteren gemässigten Zonen am häufigsten nächst dem in den polaren Zonen am besten entwickelt“. Hvad kan grunden være hertil? Jeg tror, at polyzoernes rige udvinding i de polare have hænger sammen med de selvsamme haves store planktonrigdom. Ifølge sin bygning og sit fastsiddende voksesæt er polyzoerne udelukkende henvist til at leve af plankton eller af organiske rester, som findes suspenderet i vandet\*\*). Heraf synes at frem-

*Diastopora maeandrina*, Wood.

*Bowerbankia arctica*, Busk.

*Buskia nitens*, Alder.

These amount to about 14 per cent of the total number of species in the list. The greater number of the above-named species have not been observed in Spitsbergen or the Kara Sea.

Of the 7 arctic forms that occur in Queen Charlotte Islands, but not on the shores of Great Britain, there is only one, namely *Cellaria articulata*, that has not yet been incorporated in our fauna. The other 6 (*Flustra membranaceo-truncata*, *Membranipora arctica*, *Myrionozoum coarctatum*, *Rhamphostomella plicata*, *Cellepora incrassata*, *Retepora elongata*) are well known from our arctic region.

In the summer of 1894, when, off Nordkyn in Finmark, I drew up a *Laminaria hyperborea* that was covered from top to bottom (70 cm.) with a luxuriant growth of *Gemellaria loricata*. I was struck with this clear evidence of vital force. During my expedition last winter, I had occasion to dredge a little in narrow channels in Finmark where the current was strong, and it proved that there too, certain species, such as *Gemellaria*, *Menipea*, etc. were of an exceptionally strong growth. The study of polyzoans thus strengthens the general impression that arctic animals as a rule are strong and thriving. In other words, arctic forms on the whole, exhibit a superiority as to size and development, to their near relations among the boreal animals. Dr. Pfeffer\*) also says of polyzoans: „Sie fehlen nirgends völlig, sind aber in den Tropen und den grossen Tiefen sparsamer, dagegen in den kälteren gemässigten Zonen am häufigsten nächst dem in den polaren Zonen am besten entwickelt“. What can be the reason of this? I believe that the luxuriant development of the Polyzoa in the polar sea is connected with the great abundance of plankton in that sea. From their structure and their fixed manner of growth, polyzoans are compelled to live exclusively on plankton or organic remains that are found suspended in the water\*\*). From this it would

\*) Die niedere Tierwelt des antarktischen Ufergebietes.

\*\*) Ved en enkelt anledning har jeg seet individerne i en polyzokoloni foretage bevægelser, som jeg opfattede som spisning. Paa ruderne i et af akvarierne ved den biologiske station havde nemlig fæstet sig kolonier af *Membranipora membranacea*, uidentvil grundlagt af larver, som var indkomne med ledningsvandet. Jeg kunde da tydeligt se, hvorledes polypiderne uophørligt skjøv sin tentakelkrans sammenlagt i form af et rør ud af munden, derpaa sprede kransen ud i tragtform for saa efter en liden stunds forløb at trække den ind. Det er muligt at dette ogsaa var en aandedrætsbevægelse, men at der paa den maade tillige skede en tilførsel af næring, synes mig utvilsomt. Egentlig talt kan man neppe tænke sig nogen anden maade at spise paa for disse dyr. I det samme akvarium har jeg seet en sjøpølse (*Cucumaria frondosa*) foretage tentakelbevægelser, som ganske sikkert havde med ernæringen at gøre. Hos *Cucumaria* blev ikke hele tentakelkransen trukket ind samtidig, men hver enkelt af hovedgrenene blev afvekslende puttet ind i munden.

\*) Die niedere Tierwelt des antarktischen Ufergebietes.

\*\*) On one occasion I have seen the individuals in a colony of Polyzoa going through movements which I took to be eating. Colonies of *Membranipora membranacea* had fastened themselves to the glass in one of the aquaria in the biological station, without doubt growing upon larvæ that had come in with the water-supply. I could distinctly see how the polypides incessantly pushed out their circlet of tentacles folded together in the form of a tube, and then spread them out in a funnel-shape, only to draw them in again in a little while. It is possible that this was also a respiratory movement, but I have no doubt whatever that in this way a supply of nourishment was also taken in. Strictly speaking, it is hardly possible to imagine any other way for these animals to eat. In the same aquarium, I have also seen a sea-cucumber (*Cucumaria frondosa*) making tentacular movements which were certainly connected with feeding. In *Cucumaria* the whole circlet of tentacles was not drawn in at once, but each of the main branches was put into the mouth in turn.

gaa med sikkerhed, at polyzomængden maa staa i afhængighedsforhold til planktonmængden. Jeg skal imidlertid ikke her gaa nærmere ind paa dette spørgsmål. Ved de paa-begyndte undersøgelser i det nordlige Norge haaber jeg senere at kunne levere bidrag til forstaaelse af polyzoernes samt ogsaa andre dyregruppers biologi.

appear without doubt that the quantity of polyzoans must be dependent upon the quantity of plankton. I shall not, however, go further into this question here. After the investigations begun in northern Norway, I hope to be able subsequently to contribute towards an understanding of the biology of the Polyzoa and other groups of animals.



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Bidenkaps arbeide i Tromsø museums aarshefte, 20, 1897 (Undersøgelser over Lyngenfjordens evertebratfauna) kom mig ihænde, efterat manuscriptet var næsten færdigt.

Bidenkap's paper in the Tromsø Museum Year-book, 20, 1897 (Undersøgelser over Lyngenfjordens evertebratfauna) did not come under my notice until my manuscript was almost ready.

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- 4.	<i>Menipea normani</i> . Del af en gren, det øverste avicularium er afbrudt . . . . .	60, 1
- 5.	<i>Menipea normani</i> . Bagsiden af zoarium visende udspringet af kitintuberne (the radical fibres), af hvilke den øverste løber efter basis af en bifurkation . . . . .	60, 1
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- 7.	<i>Menipea normani</i> . Zoéciemundingen og frontaviculariet . . . . .	60, 1
- 8.	<i>Menipea normani</i> . Frontaviculariet set fra siden . . . . .	100, 1
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- 10.	<i>Entalophora deflexa</i> , Smitt. Koloni paa en liden sten (St. 363) . . . . .	3, 1
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- 13.	<i>Mucronella sincera</i> , Smitt. Zoécier af en koloni fra havet ved Nordkap . . . . .	30, 1
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- 15.	<i>Mucronella sincera</i> , Smitt. Zoécier af en koloni fra Hammerfest . . . . .	30, 1
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- 4.	<i>Menipea normani</i> . Part of branch; uppermost avicularium broken off . . . . .	60, 1
- 5.	<i>Menipea normani</i> . Back of zoarium, showing origin of chitinous tubes (radical fibres), of which the uppermost runs along the base of a bifurcation . . . . .	60, 1
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- 10.	<i>Entalophora deflexa</i> , Smitt. Colony on small stone (St. 363) . . . . .	3, 1
- 11.	<i>Entalophora deflexa</i> , Smitt. Part of a branch . . . . .	30, 1
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- 15.	<i>Mucronella sincera</i> , Smitt. Zoëcia of colony from Hammerfest . . . . .	30, 1
- 16.	<i>Defrancia lucernaria</i> , M. Sars. Colony from Station 323 . . . . .	1, 1
- 17.	<i>Defrancia lucernaria</i> , M. Sars. Colony from same place, seen from above . . . . .	1, 1





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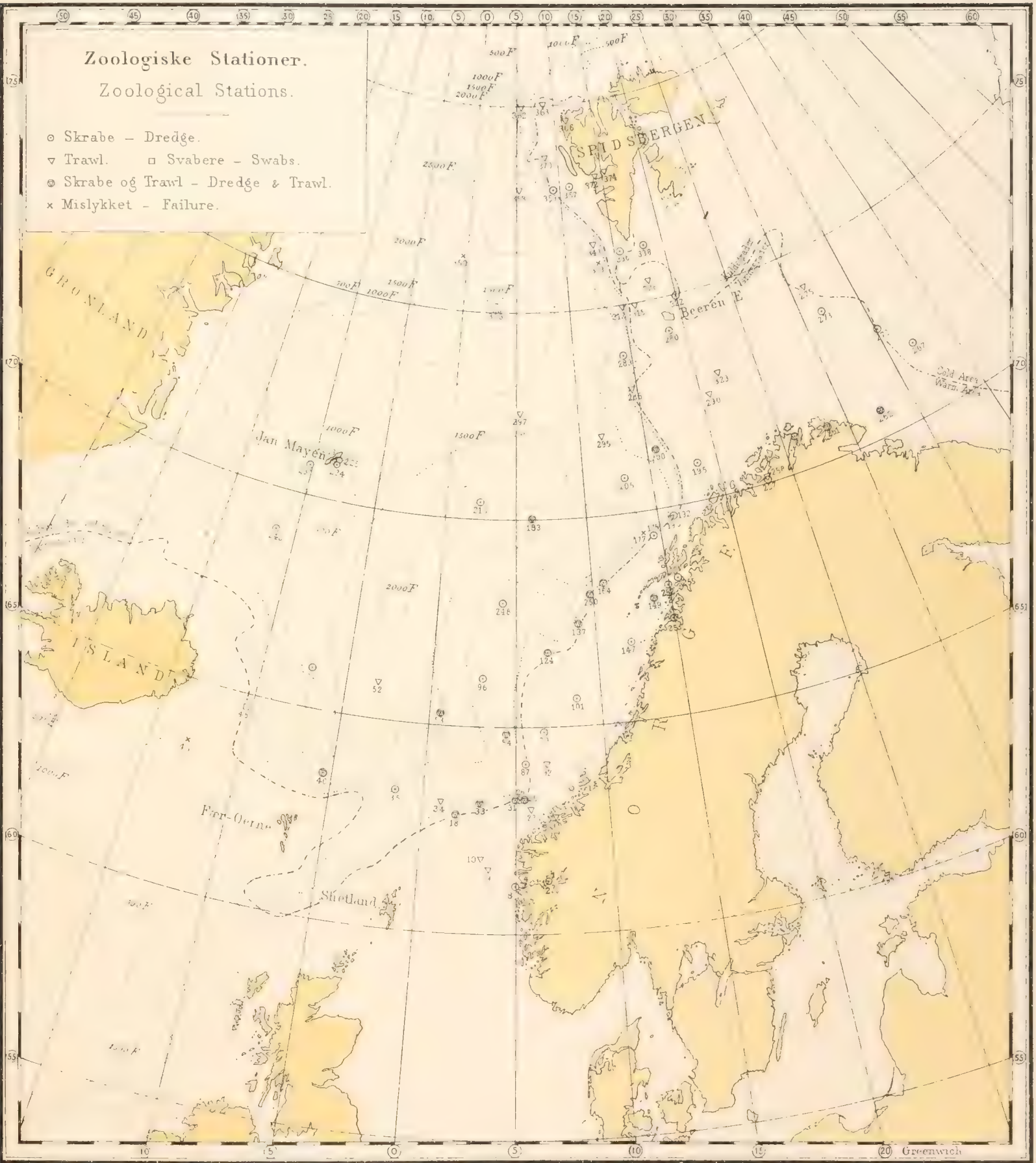






Zoologiske Stationer. (Zoological Stations.)												
Station No.	Datum. (Date.)	Nordlig Bredde.		Længde fra Greenwich.		Dybde. (Depth.)		Bundens Tempe- ratur. (Temperature at Bottom.) C.	Bunden.	Bottom.	Apparat. (Apparatus.)	
		(North Latitude.)		(Longitude)		Engl. Favne. (Fathoms.)	Meter. (Metres)				S. Skrabe. (Dredge.)	T. Trawl. s. Svabere (Swabs.)
1876												
1	Juni 3	61°	13'	6°	36'	E.	650	1189	6.66	Sandler.	Sabulous Clay.	S.
2	(June) 3	61	10	6	32	E.	672	1229	6.7	Sandler.	Sabulous Clay.	T.
4	" 8	61	5	5	14	E.	566	1035	6.6	Sandler, Grus, Singel.	Sabulous Clay, Pebbles.	T.
8	" 9	61	0.	4	49	E.	200	366	6.6	Ler, Sand, Sten.	Clay, Sand, Stones.	S.
9	" 20	61	30	3	37	E.	206	377	5.9	Ler.	Clay.	T.
10	" 21	61	41	3	19	E.	220	402	6.0	Slik, Ler.	Ooze, Clay.	T.
18	" 21	62	44	1	48	E.	412	753	-1.0	Ler.	Clay.	S. T.
23	" 23	62	52	5	50	E.						T.
25	" 28	63	10	5	25	E.	98	179	6.9	Sandler.	Sabulous Clay.	T. S.
26	" 28	63	10	5	16	E.	237	433	7.1	Sandler.	Sabulous Clay.	S.
31	" 29	63	10	5	0	E.	417	703	1.0	Sandler.	Sabulous Clay.	S. T.
33	" 30	63	5	3	0	E.	525	960	-1.1	Ler.	Clay.	T. S.
34	Juli 1	63	5	0	53	E.	587	1073	1.0	Ler.	Clay.	T.
35	(July) 5	63	17	1	27	W.	1081	1977	-1.0	Biloculinler.	Biloculina Clay.	S.
40	" 18	63	22	5	29	W.	1215	2222	-1.2	Biloculinler.	Biloculina Clay.	S. T.
48	Aug. 6	64	36	10	22	W.	299	547	-0.3	Mørkegraat Ler.	Dark-grey Clay.	s.
51	" 7	65	53	7	18	W.	1163	2127	-1.1	Biloculinler.	Biloculina Clay.	S.
52	" 8	65	47	3	7	W.	1861	3403	-1.2	Biloculinler.	Biloculina Clay.	T.
53	" 10	65	13	0	33	E.	1539	2814	-1.3	Biloculinler.	Biloculina Clay.	S & T.
54	" 12	64	47	4	24	E.	601	1099	1.2	Biloculinler.	Biloculina Clay.	S & T.
60	" 20	64	40	9	30	E.	118	216	7.0	Haardt Ler.	Hard Clay.	S.
78	" 21	64	48	6	45	E.	155	283	7.0	Sandler.	Sabulous Clay.	S.
79	" 21	64	48	6	32	E.	155	283	6.9	Sandler.	Sabulous Clay.	S.
87	" 22	64	2	5	35	E.	498	911	-1.1	Ler.	Clay.	S.
92	" 22	64	0	6	42	E.	178	326	7.2	Sandholdigt Ler.	Sabulous Clay.	T.
93	" 24	62	41	7	8	E.	158	289	6.4	Blødt Ler.	Soft Clay.	T.
(Romsdalsfjord).												
1877												
96	Juni 16	66	8	3	0	E.	805	1472	-1.1	Biloculinler.	Biloculina Clay.	S.
101	(June) 17	65	36	8	32	E.	223	408	6.0	Sandler.	Sabulous Clay.	S.
124	" 19	66	41	6	59	E.	350	640	-0.9	Grovkornet Ler.	Coarse Clay.	S. T.
137	" 21	67	24	8	58	E.	452	827	-1.0	Ler.	Clay.	S. T.
147	" 22	66	49	12	8	E.	142	260	6.2	Graat Ler.	Grey Clay.	S.
149	" 23	67	52	13	58	E.	135	247	4.9	Ler.	Clay.	T. S.
(Vestfjord).												
164	" 29	68	21	10	40	E.	457	836	-0.7	Sandler.	Sabulous Clay.	S. T.
175	Juli 2	69	17	14	35	E.	415	759	3.0	Sand, Stene.	Sand, Stones.	S.
176	(July) 3	69	18	14	33	E.	536	980	-0.2	Ler.	Clay.	S.
177	" 3	69	25	13	49	E.	1443	2639	1.2	Biloculinler.	Biloculina Clay.	S & T.
183	" 5	69	59	6	15	E.	1710	3127	1.3	Biloculinler.	Biloculina Clay.	S & T.
190	" 7	69	41	15	51	E.	870	1591	1.2	Sandholdigt Ler.	Sabulous Clay.	T.
192	" 7	69	46	16	15	E.	649	1187	0.7	Sandler.	Sabulous Clay.	S.
195	" 16	70	55	18	38	E.	107	196	5.1	Sten, Ler.	Stones, Clay.	S.
200	" 17	71	25	15	41	E.	620	1134	1.0	Ler.	Clay.	S. T.
205	" 18	70	51	13	3	E.	1287	2354	-1.2	Biloculinler.	Biloculina Clay.	S.
213	" 26	70	23	2	30	E.	1760	3219	-1.2	Biloculinler.	Biloculina Clay.	S.
223	Aug. 1	70	54	8	24	W.	70	128	0.6	Graasort Sandler.	Dark-grey sabulous Clay	S.
(Jan Mayen).												
224	" 1	70	51	8	20	W.	95	174	-0.6	Graasort Sandler.	Dark-grey sabulous Clay	S.
225	" 2	70	58	8	4	W.	195	357	-0.6	Graasort Sandler.	Dark-grey sabulous Clay	S.
226	" 2	70	59	7	51	W.	340	622	-0.6	Sort Sand og Ler.	Black Sand and Clay.	S.
237	" 3	70	41	10	10	W.	263	481	-0.3	Brunt Ler, Stene.	Brown Clay, Stones.	S.
240	" 4	69	2	11	20	W.	1004	1836	-1.1	Biloculinler.	Biloculina Clay.	S.

Station No.	Datum. (Date.)	Nordlig Bredde. (North Latitude.)	Længde fra Greenwich. (Longitude.)	Dybde. (Depth)		Bundens Temperatur. (Temperature at Bottom.) C.	Bunden.	Bottom.	Apparat. (Apparatus.) S. Skrabe. (Dredge.) T. Trawl. S. Svabere. (Swabs.)
				Engl. Favne. (Fathoms.)	Meter. (Metres.)				
248	Aug. 8	67 56	4 11 E.	778	1423	—1.04	Biloculinler.	Biloculina Clay.	S.
251	" 9	68 6	9 44 E.	634	1159	—1.3	Ler.	Clay.	S.
252	" 11	Vestfjord.					Ler.	Clay.	S.
253	" 15	Skjerstadsfjord.		263	481	3.2	Ler.	Clay.	S.
253b	" 17	Saltstrømmen.		90	165		Sten.	Stones.	S.
255	1878. Juni 19	68° 12'	15° 40' E.	341	624	6.5	Ler.	Clay.	S.
257	(June) 21	70 4	23 2 E.	160	293	3.9	Ler.	Clay.	S.
258	" 21	70 13	23 3 E.	230	421	4.0	Ler.	Clay.	T.
260	" 24	70 55	26 11 E.	127	232	3.5	Ler.	Clay.	S. T.
261	" 25	70 47	28 30 E.	127	232	2.8	Ler.	Clay.	S. T.
262	" 27	70 36	32 35 E.	148	271	1.9	Ler.	Clay.	T. S.
267	" 29	71 42	37 1 E.	148	271	—1.4	Ler, Sten.	Clay, Stones.	S.
270	" 30	72 27	35 1 E.	136	249	—0.0	Ler.	Clay.	S.
273	Juli 1	73 25	31 30 E.	197	360	2.2	Ler.	Clay.	S.
275	(July) 2	74 8	31 12 E.	147	269	—0.4	Ler.	Clay.	T.
280	" 4	74 10	18 51 E.	35	64	1.1	Sten.	Stones.	S.
283	" 5	73 47	14 21 E.	767	1403	—1.4	Ler.	Clay.	S.
286	" 6	72 57	14 32 E.	447	817	—0.8	Ler.	Clay.	T.
290	" 7	72 27	20 51 E.	191	349	3.5	Sandler.	Sabulous Clay.	T.
295	" 14	71 59	11 40 E.	1110	2030	—1.3	Biloculinler.	Biloculina Clay.	T.
297	" 16	72 36	5 12 E.	1280	2341	—1.4	Biloculinler.	Biloculina Clay.	T.
303	" 19	75 12	3 2 E.	1200	2195	—1.6	Biloculinler.	Biloculina Clay.	T.
312	" 22	74 54	14 53 E.	658	1203	—1.2	Ler.	Clay.	T.
315	" 22	74 53	15 55 E.	180	329	2.5	Ler, Sand.	Clay, Sand.	T.
322	" 23	74 57	19 52 E.	21	38	0.2	Haard.	Hard.	S.
323	" 30	72 53	21 51 E.	223	408	1.5	Ler.	Clay.	T.
326	Aug. 3	75 31	17 50 E.	123	225	1.6	Ler.	Clay.	T.
333	" 4	76 6	13 10 E.	748	1368	—1.3	Biloculinler.	Biloculina Clay.	T.
336	" 5	76 19	15 42 E.	70	128	0.4	Ler, Haard B.	Clay, Hard Bottom.	S.
338	" 6	76 16	17 49 E.	146	267	—1.1	Sten.	Rock.	S.
343	" 7	76 34	12 51 E.	743	1359	—1.2	Ler.	Clay.	T.
350	" 8	76 26	0 29 W.	1686	3083	—1.5	Biloculinler.	Biloculina Clay.	T.
353	" 10	77 58	5 10 E.	1333	2438	—1.4	Biloculinler.	Biloculina Clay.	T.
357	" 12	78 3	11 18 E.	125	229	1.9	Ler.	Clay.	S.
359	" 12	78 2	9 25 E.	416	761	0.8	Ler.	Clay.	S.
362	" 14	79 59	5 40 E.	459	839	—1.0	Ler.	Clay.	T.
363	" 14	80 3	8 28 E.	260	475	1.1	Ler.	Clay.	T.
366	" 17	79 35	11 17 E.	61	112	—2.1	Ler.	Clay.	T.
"	"	Magdalene Bay.		37	68	—0.2	Ler.	Clay.	T.
370	" 18	78 48	8 37 E.	109	199	1.1	Ler.	Clay.	T.
372	" 19	78 9	14 7 E.	129	236	1.2	Ler.	Clay.	T.
374	" 22	78 16	15 33 E.	60	110	0.7	Ler.	Clay.	T.
		(Isfjord). (Advent Bay).							









DEN NORSKE NORDHAVS-EXPEDITION  
1876—1878.

# ZOOLOGI.

## THALAMOPHORA.

VED

HANS KIÆR.

MED 1 PLANCHE OG 1 KART.



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CHRISTIANIA.

GRØNDAHL & SØNS BOGTRYKKERI.

1899.



THE NORWEGIAN NORTH-ATLANTIC EXPEDITION  
1876—1878.

ZOOLOGY.

THALAMOPHORA.

BY

HANS KIÆR.

WITH 1 PLATE & 1 MAP.



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CHRISTIANIA.

PRINTED BY GRØNDAHL & SØN.

1899.



Som Grundlag for min Bearbejdelse af Nordhavsexpeditionens Thalamophorer forelaa der en særdeles righoldig Samling af Bundprøver. Efter Konference med Hr. Prof. G. O. Sars, for hvis velvillige Hjælp ved flere Anledninger jeg her udtaler min Tak, har jeg dog ikke fundet det nødvendigt at gennemgaa alle Bundprøverne, da de nemlig ofte er tagne med forholdsvis korte Mellemrum og saaledes Faunaen kunde formodes at være meget ensartet paa de Stationer, der laa i hinandens Nærhed. Dette har ogsaa vist sig at være Tilfældet ved den foreløbige Undersøgelse, som jeg foretog af ca. 100 Bundprøver fra alle Dele af Nordhavet. Disse Bundprøver var fordelt saaledes:

Fra Sognefjorden . . . . .	1 Bundprøve
„ det graa Ler langs Norges Kyst . .	34 Bundprøver
„ - „ - ved Beeren Eiland . .	3 „
„ - „ - Spidsbergen . . . .	11 „
„ - „ - Jan Mayen. . . . .	4 „
„ - „ - Island . . . . .	4 „
„ - „ - Færøerne . . . . .	1 „
„ Overgangsleret . . . . .	14 „
„ Biloculinaleret . . . . .	23 „
„ Rhabdamminaleret . . . . .	8 „

Tilsammen 103 Bundprøver

Ved den foreløbige Undersøgelse er Bundprøverne behandlet paa følgende Maade: Det Kvantum, der skulde undersøges, i Regelen 3—4 cm.<sup>3</sup>, blev opblødt og udrørt i Vand, hvorpaa den grumsede Vædske frasiltes gennem en fin Sil af ca. 0.08 mm.s Maskevidde. Det tilbageblevne undersøgtes under Mikroskopet.

Paa Grundlag af de Erfaringer, som ovennævnte Fremgangsmaade gav, udvalgte nu et begrændset Antal af de paa Arter og Exemplarer rigeste Bundprøver, ialt 19, ligelig fordelt over alle Lersorter. Disse Bundprøver er fra følgende Stationer: 9, 92, 255, 135, 192, 262, 268, 287, 342, 368, 355, 353, 296, 214, 40, 48, 231, 223, 37.

Disse 19 Bundprøver blev behandlet efter den af Dr. Madsen beskrevne Methode<sup>1</sup>, hvortil 1/4 eller 1/2 Liter af

<sup>1</sup> V. Madsen, Istidens Foraminiferer i Danmark og Holsten. Kjøbenhavn. 1895.  
Den norske Nordhavsexpedition. Hans Kiær: Thalamophora.

A particularly large collection of bottom-samples formed the basis for my investigation of the Thalamophora of the North Atlantic Expedition. After consultation with Prof. G. O. Sars, for whose ready assistance on several occasions I would here express my thanks, I have not considered it necessary to go through all the samples, as they were often taken at comparatively short intervals, and the fauna might naturally be supposed to be very homogeneous at stations lying near to one another. This has also proved to be the case in the preliminary examination that I made of about 100 bottom-samples from all parts of the North Sea. These samples were distributed as follows:

From Sognefjord . . . . .	1 sample
„ the gray clay along the Norw. coast .	24 samples
„ - „ - near Bear Island . .	3 „
„ - „ - „ Spitsbergen . . .	11 „
„ - „ - „ Jan Mayen Island	4 „
„ - „ - „ Iceland . . . .	4 „
„ - „ - „ Farøe Islands . .	1 „
„ - transition clay . . . . .	14 „
„ - Biloculina „ . . . . .	23 „
„ - Rhabdammina clay. . . . .	8 „

Total 103. samples

In the preliminary investigation, the samples were treated in the following manner: the quantity to be examined, generally 3 or 4 cubic cm. was softened and stirred up in water, and the muddy liquid strained through a fine sieve, whose meshes measure about 0.08 mm. in width. What was left was examined under the microscope.

With the experience gained from the above method of procedure as a basis, a limited number of samples in which species and specimens were most abundant, were then selected — 19 in all, distributed equally among all kinds of clay. These samples were from the following stations: 9, 92, 255, 135, 192, 262, 268, 287, 342, 368, 355, 353, 296, 214, 40, 48, 231, 223 and 37.

These 19 samples were treated according to the method described by Dr. Madsen<sup>1</sup>, in which from 1/4 to 1/2

<sup>1</sup> V. Madsen, Istidens Foraminifera i Danmark og Holsten. Copenhagen. 1895.



Bundproven blev benyttet. Denne Methode viste sig at give udmærkede Resultater.

Som Prove paa de forskjellige Lersorters Fauna skal her opregnes de Arter, der ved Dr. Madsens Methode er fundet i 5 Bundprover, nemlig 1 fra Biloculinaeret, 1 fra Overgangsleret, 1 fra det graa Ler langs Norges Kyst, 1 fra Rhabdamminaleret og 1 fra det graa Ler ved Spidsbergen. Disse Bundprover er ikke netop af de paa Arter og Exemplarer rigeste, men udvalgt saaledes, at de ialmindelighed forekommende Arter saavidt mulig kommer med. De er fra følgende Stationer: 9, 135, 296, 268, 368.

Foruden Bundproverne havde ogsaa en hel Del Tuber med Thalamophorer fra Skrabningerne. Disse Tuber indeholdt ofte en stor Mængde af de større og mere iøjnefaldende Arter<sup>1</sup>. Da der ikke fandtes nogen saadan Prøve fra Skrabningerne fra det graa Ler, skal der her blot gives en Fortegnelse over de Arter, der ved Skrabningerne er fundet paa 2 Stationer, nemlig en fra Biloculinaeret (Station 40) og en fra Rhabdamminaleret (Station 274).

#### Station 9.

v == very common meget almindelig

c == common almindelig.

n == not common ikke almindelig.

r == rare, sjelden.

*Biloculina simplex* (r), *elongata* (r), *sphaera* (r), *Quinqueloculina seminulum* (r), *agglutinans* (r), *Gaudryina chilostoma* (r), *Bolivina dilatata* (r), *Bulimina elipsoides* (r), *marginata* (r), *Normanni* (r), *Cassidulina laevigata* (n), *Nodosaria communis* (r), *laevigata* (n), *scalaris* (r), *Lagena marginata* (n), *distoma* (r), *gracillima* (r), *semistriata* (r), *hexagona* (r), *Polymorphina rotundata* (r), *Uvigerina pygmaea* (v), *angulosa* (n), *Truncatulina lobatula* (n), *Anomalina coronata* (r), *Globigerina bulloides* (n), *inflata* (r), *Pullenia sphaeroides* (r), *Sphaeroidina bulloides* (r), *Nonionina umbilicatula* (n), *scapha* (r), *stelligera* (v), *Operculina ammonoides* (c).

#### Station 135.

*Ammodiscus incertus* (r), *Nodulina scorpiura* (n), *guttifera* (n), *Quinqueloculina seminulum* (n), *Bolivina punctata* (n), *Cassidulina laevigata* (c), *Virgulina schreibersiana* (r), *Nodosaria calomorpha* (r), *Glandulina laevigata* (r), *Lagena laevis* (r), *distoma* (n), *hexagona* (r), *striata* (r), *sulcata* (r), *var. interrupta* (r), *marginata* (n), *acuta* (n), *Uvigerina angulosa* (n), *Haplophragmium latidorsatum* (c), *nanum* (n), *Truncatulina lobatula* (n), *Wüllersdorffi* (n), *Anomalina grosseruga* (c), *Pulvinulina punctulata* (n), *Rotalia orbicularis* (n), *Discorbina vilardeboana* (r), *Globigerina bulloides* (v), *pachyderma* (v), *Orbulina universa* (r), *Pullenia sphaeroides* (n), *Nonionina umbilicatula* (n), *Polystomella striatopunctata* (r).

<sup>1</sup> Alle smaa Exemplarer var i Regelen fjernede.

a litre of the sample was used. This method proved to be productive of excellent results.

The species found by Dr. Madsen's method in 5 bottom-samples will here be considered as samples of the fauna of the different kinds of clay, viz. 1 from *Biloculina* clay, 1 from transition clay, 1 from the gray clay along the coast of Norway, 1 from the *Rhabdammina* clay, and 1 from the gray clay at Spitzbergen. These samples are not of the richest in species and specimens, but are chosen so as to include the species of most general occurrence. They are from the following stations: 9, 135, 296, 268 and 368.

In addition to the bottom-samples, there were also a number of tubes containing *Thalamophora* from dredgings. These tubes often contained a considerable number of large and conspicuous species<sup>1</sup>. As there was no such sample from dredgings from the gray clay, a list will only be given of the species found in dredging at 2 stations, namely, one from the *Biloculina* clay (Station 40), and one from the *Rhabdammina* clay (Station 274).

#### Station 296.

*Reophax diffugiiformis* (r), *Nodulina guttifera* (n), *Biloculina laevis* (c), *Nodosaria calomorpha* (n), *Lagena laevis* (c), *apiculata* (c), *marginata* (c), *feildeniana* (c), *Cristellaria crepidula* (r), *Haplophragmium globigeriniforme* (n), *latidorsatum* (c), *pseudospirale* (c), *anceps* (n), *Truncatulina Wüllersdorffi* (c), *Anomalina grosseruga* (c), *Pulvinulina punctulata* (n), *Rotalia orbicularis* (n), *Discorbina araucana* (n), *Globigerina bulloides* (v), *pachyderma* (v).

#### Station 268.

*Rhabdammina abyssorum* (r), *Hyperammia ramosa* (n), *Bulimina elipsoides* (n), *Virgulina schreibersiana* (r), *Nodosaria calomorpha* (r), *Glandulina laevigata* (r), *Lagena laevis* (n), *distoma* (r), *gracilis* (r), *marginata* (n), *lagenoides* (r), *striatopunctata* (r), *Uvigerina pygmaea* (r), *Haplophragmium canariense* (r), *Truncatulina lobatula* (n), *ungariana* (r), *Nonionina scapha* (n), *umbilicatula* (n), *stelligera* (n), *Polystomella striatopunctata* (r), *arctica* (c).

#### Station 368.

*Bulimina elipsoides* (n), *Virgulina schreibersiana* (r), *Nodosaria pauperata* (r), *Glandulina laevigata* (r), *Lagena laevis* (r), *distoma* (r), *striata* (r), *sulcata* (r), *marginata* (n), *orbignyana* (r), *globosa* (r), *acuta* (r), *striatopunctata* (r), *Cristellaria rotulata* (r), *Uvigerina pygmaea* (r), *Rupertia stabilis* (r), *Truncatulina lobatula* (r), *refulgens* (n), *Pulvinulina Karstenii* (n), *Globigerina bulloides* (c), *pachyderma* (c), *Pullenia sphaeroides* (r), *Nonionina umbilicatula* (n), *turgida* (r), *scapha* (r), *Polystomella striatopunctata* (r), *arctica* (r).

<sup>1</sup> All small specimens were, as a rule, removed.

## Station 40.

*Astrorhiza arenaria* (c), *crassatina* (c), *Cornuspira foliacea* (c), *Hyperammia elongata* (r), *Biloculina laevis* (v), *arctica* (r), *sphaera* (n), *Textularia agglutinans* (n), *Nodosaria communis* (r), *panperata* (n), *Glandulina laevigata* (c), *aequalis* (n), *Vaginulina costata* (n), *Polymorphina angusta* (r), *acuta* (n), *Haplophragmium latidorsatum* (v), *Planorbulina Wüllersdorffii* (c).

Paa Hydroider fra Nordhavsexpeditionen saaes mange Exemplarer af *Rupertia* og *Truncatulina* fastheftede. Desuden var ofte en Mængde *Thalamophorer* hørende til en hel Del Arter infiltrerede i Hydroidernes traade.

I Nordhavsexpeditionens Plankton fandtes ingen pelagiske *Thalamoporer*. Derimod har jeg fundet mange Exemplarer af *Globigerina bulloides* i Plankton, der paa Foranstaltning af dr. Hjort blev taget mellem Trondhjem og Island i April—Juni 1898<sup>1</sup>. Disse *Globigeriner* fandtes dels med dels uden Pigger dog sjelden i betydeligt Antal i hver Planktonprøve.

Foruden *Thalamophorer* saaes i Bundprøverne ofte mange uorganiske Levninger af andre Dyreformer. Dog kunde ingen *Radiolarier* opdages, skjønt enkelte Arter af disse undertiden forekommer i Plankton fra Nordhavet. saaledes optræder *Acanthonia echinoides* Haeckel af og til i uhyre Mængde i Plankton fra Norges Vestkyst, medens en anden Art *Acanthostaurus pallidus* Haeckel er meget sjældnere.

## Bemærkninger til Tabellen.

Følgende Oplysninger er nødvendige til Forstaaelse af Tabellen:

De under hver Rubrik opførte Tal betegner Antallet af Stationer, hvorfra en Bundprøve eller en Prøve fra Skrabningerne er undersøgt.

Jeg har inddelt de forskellige Lersorter ialt i 16 Underafdelinger for at vise *Thalamopharernes* geografiske og bathymetriske Udbredelse og ikke fordi der altid raader nogen væsentlig Forskjel inden hver af disse Underafdelingers Fauna. Det graa Ler er ved Hjælp af den 63de Breddegrad og den 19de Længdegrad delt i 3 Dele, hvoraf den sydlige omfatter 10, den nordlige 20 og den østlige 5 Stationer. Af Overgangsleret og *Biloculina*leret har jeg adskilt 3 Partier, et sydligt og et nordligt, der har sin naturlige Grændse i Tværryggen mellem *Rhabdamminaleret* og de to nævnte Havdyb. *Rhabdamminaleret* er delt i 2 Dele ved den 19de Længdegrad.

## Station 274.

*Astrorhiza crassatina* (c), *Psammospira fusca* (n), *Tholosina bulla* (c), *Rhabdammina abyssorum* (v), *discreta* (n), *Hyperammia arborescens* (r), *Nodulina scorpiura* (c), *Biloculina simplex* (r), *Miliolina tricarinata* (r), *seminulum* (r), *Valvulina conica* (r), *Nodosaria obliqua* (r), *Haplophragmium crassimargo* (r), *Truncatulina lobatula* (c).

Many specimens of *Rupertia* and *Truncatulina* attached were to Hydroida from the North Atlantic Expedition. There were frequently moreover, a number of *Thalamopora*, belonging to a great many species, entangled in the filaments of the hydroids.

There were no pelagic *Thalamophora* in the North Atlantic Expedition's plankton. On the other hand, I found many specimens of *Globigerina bulloides* in plankton which, under Dr. Hjort's direction, was taken between Trondhjem and Iceland, between the months of April and Juni 1896<sup>1</sup>. These *Globigerina* were found both with and without spines, but unusually in large numbers in every plankton sample.

Besides *Thalamophora*, many inorganic remains of other animal forms were frequently seen in the bottom-samples. No *Radiolaria*, however, could be discovered although a few species sometimes occur in plankton from the North Sea. In this way *Acanthonia echinoides* Haeckel now and then appears in immense numbers in plankton from the west coast of Norway, while another species, *Acanthostaurus pallidus* Haeckel is far less frequent.

## Remarks on the Table.

The following information is necessary to an understanding of the table:

The figure under each head denotes the number of stations from which a bottom-sample or a sample from the dredgings has been examined.

I have divided the various kinds of clay into 16 subdivisions in all, in order to show the geographic and bathymetric distribution of the *Thalamophora*, and not because there is always some essential difference in the fauna of each of these subdivisions. The gray clay is divided, by the aid of the 63rd parallel of latitude, and 19th of longitude, into 3 parts, of which the southern one includes 10, the northern 20, and the eastern 5 stations. I have divided the transition clay and the *Biloculina* clay into 3 divisions, one southerly and one northerly, which having their natural boundaries in the cross ridge between the Norway and the Swedish deep, and an easterly division between the *Rhabdammina* clay and the two above-mentioned deeps. The *Rhabdammina* clay is divided into two parts by the 19th parallel of longitude.

<sup>1</sup> Den nordligste Station var fra 69° 40' N. B. 11° 30' L. W. 5. 6. 1898. Vandets Temperatur + 0.8.

<sup>1</sup> The most northerly station was 65° 40' N. Lat. & 11° 30' W. Long. Juni 5, 1898. Temperature of water: 0.8°.



Under Gjennemlæsningen af Tabellen maa der lægges Mærke til, at der fra det graa Ler blot haves Bundprøver, medens der fra de øvrige Lersorter ogsaa findes Prøver fra Skrabmingerne.

Arterne er opført efter Rhumblers nye System (L. Rhumbler, Entwurf eines natürlichen Systems der Thalamophoren. Nachrichten der k. Ges. d. Wiss. Goettingen 1895, Heft. 1, p. 50—98).

In a perusal of the table, it should be observed that there were only bottom-samples from the gray clay, while from the other kinds of clay, there were samples of dredgings as well.

The species are classed according to Rhumbler's new system (L. Rhumbler, Entwurf eines natürlichen Systems der Thalamophoren Nachrichten der k. Ges. d. Wiss. Goettingen 1895, Part I. pp. 50—98)

		Graat Ler. Grey Clays.												Rhabdam- minaler.		Overgang-ler.		Transition Clay.			Biloculiner.			Boloculina Clay.		
		Sognefjord.	Norge. Norway.			Boeren Eiland.	Spidsbergen.	Jan Mayen.	Island.	e	w	s	e	n	s	e	n									
			s	n	e																					
	Stationernes Antal	2	10	20	5	3	12	4	4	9	2	7	7	3	15	6	4									
1	<i>Astrorhiza arenaria</i> Norman . . .	1									1		1		1											
2	" <i>crassatina</i> Brady . . . . .						3			1	2	1	2		2	1										
3	<i>Saccammina sphaerica</i> M. Sars .	2								1																
	<i>Psammospaera fusca</i> E. Schulze	2								1	1	2														
4	<i>Stortospaera albida</i> E. Schulze .	1																								
5	<i>Thurammina papillata</i> Brady . .												1													
6	<i>Reophax difflugiiformis</i> Brady . .	1			1			1			1	1		2		1										
7	<i>Tholosina bulla</i> Brady . . . . .	1								1	1															
8	<i>Crithionina abyssorum</i> n. sp. . . .											1	1		1	1										
9	<i>Bathysiphon filiformis</i> M. Sars .	1																								
10	<i>Botellina labyrinthica</i> Brady . . .										1															
11	<i>Webbina clarata</i> Park & Jones . .	2		1		1					1															
12	<i>Rhabdammina abyssorum</i> Sars . .	1		1	1	2				5	2		3	1		1										
13	" <i>discreta</i> Brady . . . . .									1	1					1										
14	<i>Hyperammina elongata</i> Brady . . .							1			1	1	1		2											
15	" <i>arborescens</i> Norman . . . . .									1	1															
16	" <i>ramosa</i> Brady . . . . .	2								1		1	2													
17	<i>Ammodiscus incertus</i> d'Orb. . . .			1								1		1												
18	" <i>tenuis</i> Brady . . . . .												1													
19	<i>Gordiammina charoides</i> Park & Jones . . . . .	1																								
20	<i>Cornuspira carinata</i> Costa . . . .											1														
21	" <i>foliacea</i> Phil . . . . .	1		1								1	1		2											
22	" <i>striolata</i> Brady . . . . .											1	2													
23	<i>Patellina corrugata</i> Will . . . . .												1													
24	<i>Nodulina scorpiura</i> Montfort . . .		1	2	2		1	1		1	2	4	2	2	2											
25	" <i>guttifera</i> Brady . . . . .											2		2	2	1	1									
26	" <i>pilulifera</i> Brady . . . . .										1			2												
27	" <i>sabulosa</i> Brady . . . . .									1	1	1			1											
28	<i>Ashemonella catenata</i> Norman . .	1																								
29	<i>Biloculina laevis</i> DeFrance . . . .											3	3	1	11	4	4									
30	" <i>simplex</i> d' Orb . . . . .	1	1	2						1	2		1													
31	" <i>elongata</i> d'Orb . . . . .	1	2	1				1					1	1	1		1									
32	" <i>arctica</i> Goës . . . . .														1	1	1									
33	" <i>depressa</i> d'Orb . . . . .												1													
34	" <i>sphaera</i> d'Orb . . . . .	1	1	2								1	2		2											
35	<i>Triloculina oblonga</i> Montag . . . .												1													
36	" <i>valvularis</i> v. Reuss . . . . .			1		1					1		1													
37	" <i>bucculenta</i> Brady . . . . .		1			1					1	1	2													
38	" <i>trigomula</i> Lmk. . . . .											1	1													
39	" <i>tricarinata</i> d'Orb . . . . .		2							2	2	2	1	1	1											
40	<i>Quinqueloculina seminum</i> Lin. .		2	4	3	2	1	1	2	1	2	5	1		5											
41	" <i>agglutinans</i> Park&Jones . . . .		2	4	1			1	1																	
42	" <i>subrotunda</i> Montag . . . . .												1													
43	" <i>angulata</i> Will . . . . .												1													



		Graat Ler. Grey Clays.										Rhabdam- minaler.		Overgangsler.			Transition Clay.			Biloculiner.		Biloculina Clay.	
		Sognefjord.	Norge. Norway.		Beeren Eiland.	Spilsbergen.	Jan Meyen.	Island.	e	w	s	e	n	s	e	n	s	e	n				
44	<i>Ophthalmidium tumidulum</i> Brady .												1										
45	<i>Spiroloculina limbata</i> d'Orb . . .												1										
46	<i>Bigenerina digitata</i> d'Orb. . . . .		1																				
47	" <i>nodosaria</i> d'Orb . . . . .		1																				
48	<i>Textularia agglutinans</i> d'Orb . . .	2		1								2	1				2			1			
49	" <i>intermedia</i> Goës . . . . .	1								1													
50	" <i>aspera</i> Brady . . . . .	1								1													
51	" <i>Williamsoni</i> Goës. . . . .												1				1						
52	<i>Bigenerina Sarsi</i> n. sp. . . . .			1									1										
53	<i>Gaudryina chilostoma</i> Reuss . . .		1	5						1	1	1	1										
54	<i>Verneulina polystropha</i> Reuss . .											1											
55	<i>Valvulina conica</i> Park. & Jones .	1			1					1													
56	" <i>fusca</i> Will . . . . .	1		1													1						
57	<i>Bolivina punctata</i> d'Orb. . . . .			2	2	1			1		1	1	1	1									
57	" <i>dilatata</i> v. Reuss. . . . .		6	4	2								2										
59	<i>Bulimina elipsoides</i> Costa . . . . .		3	3	3		2			1	1		1										
60	" <i>marginata</i> d'Orb . . . . .	1	3	3	1			1															
61	" <i>subcylindrica</i> Brady . . . . .			1									1										
62	" <i>subteres</i> Brady . . . . .												1										
63	" <i>Normani</i> Goës . . . . .		1																				
64	" <i>convoluta</i> Williams . . . . .												1										
65	<i>Virgulina schreibersiana</i> Czjz . . .			1	3	1	1	3	1	1	1	2											
66	<i>Cassidulina laevigata</i> d'Orb . . .	1	6	15	4	2	8	2	3	6	1	4	4	2	3								
67	" <i>crassa</i> d'Orb . . . . .	1		3		1	3	1		2		1	1	2						1			
68	<i>Nodosaria communis</i> d'Orb . . . .		1	1								1		1			1			1			
69	" <i>pauperata</i> d'Orb . . . . .		1		1		1	1		1	1	1		1	3					2			
70	" <i>calomorpha</i> v. Reuss . . . . .			1						1		3	1			1							
71	" <i>inflexa</i> Reuss . . . . .			2	1																		
72	" <i>scalaris</i> Batsch . . . . .		1	3									1										
73	" <i>mucronata</i> Neugeb . . . . .											1				1							
74	" <i>obliqua</i> Lin . . . . .									1		2											
75	<i>Glandulina laevigata</i> d' Orb . . .	1	1	2			2	1		1		1	1	2	1								
76	" <i>aequalis</i> v. Reuss. . . . .							1			1	2	1	1	1	1							
77	<i>Vaginulina laevigata</i> Roem . . . .			1				1				2											
78	" <i>linearis</i> Montag . . . . .											1											
79	" <i>costata</i> Batsch . . . . .												1			2							
80	<i>Lagena laevis</i> Walk. & Boys . . .			1	1	1	2		1	2		3		1	2	1				1			
81	" <i>gracilis</i> Williams . . . . .			1				1		1		1	1	1	2					2			
82	" <i>distoma</i> Park. & Jones . . . . .		2	2			1	1		1		1											
83	" <i>globosa</i> Walk. & Jac . . . . .			1			1	1	1			1	1	1									
84	" <i>gravillima</i> Seg . . . . .		2	2	1	1	1					1		1	1								
85	" <i>semistriata</i> Williams . . . . .		1									1	1		2								
86	" <i>acuticosta</i> Reuss . . . . .												1										
87	" <i>striata</i> d'Orb . . . . .			2	1		2		1			3	1							1			
88	" <i>sulcata</i> Walk. & Jac . . . . .			2			1					2	1							1			
89	" <i>curvilineata</i> Balkw. & Millet . . . . .															1							
90	" <i>apiculata</i> Reuss . . . . .						1	1				2				3	1			1			
91	" <i>hexagona</i> Will . . . . .		1	1			1		1			3	1	1	2					1			
92	" <i>williamsoni</i> Alcock . . . . .		1										1										
93	" <i>squamosa</i> Montag . . . . .			1		1						1	1			1				1			
94	" <i>clavata</i> d'Ob . . . . .							1								1							
95	" <i>hispida</i> v. Renss . . . . .			1									1										
96	" <i>feildeniana</i> Brady . . . . .							1				1				1	1						
97	" <i>striatopunctata</i> Park. & Jones . . . . .			1						2													
98	" <i>marginata</i> Walk. & Boys . . . . .		2	4	2	1	2	1	1	2		3	1	3	3	1				2			
99	" <i>trigona-marginata</i> Park. & Jones . . . . .																						

		Graat ler. Grey Clays.													Rhabdammina-ler.		Overgangsler.			Transition Clay.			Biloculinier.			Biloculina Clay.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
		Sognefjord.	Norge. Norway.			Beeren Eiland.	Spidsbergen.	Jan Mayen.	Island.	e	w	s	c	n	s	c	n	s	c	n																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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100	<i>Lagena lucida</i> Will . . . . .																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						</

		Graat ler. Grey Clays.															
		Sognefjord.	Norge. Norway.			Beeren Eiland.	Spidsbergen.	Jan Mayen.	Island.	Rhabdammina- ler.		Overgangsler. Transition Clay.			Biloculiner. Biloculina Clay.		
			s	n	e					e	w	s	e	n	s	e	n
157	<i>Nonionina umbilicatulula</i> Montag .	1	6	12	4	2	10	2	4	6	1	3	2	2	3	1	
158	" <i>depressula</i> Walk. & Jac.					1				1			1				
159	" <i>stelligera</i> d'Orb. . . . .		1				1	1				1	1	1			
160	" <i>pompilioides</i> Ficht. & Moll . . . . .			1													
161	" <i>scapha</i> Ficht & Moll .		4	5	4	1	4	1	1	1	1	1	1				
162	" <i>turgida</i> Will . . . . .						1		1				1				
163	<i>Polytomella striatopunctata</i> Ficht. & Moll . . . . .			3		1	3			2	1	3	1	1			
164	" <i>arctica</i> Park. & Jones .						1		1	1							
165	" <i>subnodosa</i> Münster . . .						1					1					
166	<i>Operculina ammonoides</i> Gron . . .	1	5	10	4												

### Chrithionina abyssorum n. sp.

Kugleformet eller oval, med ugjevn, graa Overflade, hvori undertiden er fastheftet Svampespikler, der stritter i alle Retninger. Væggen hvid, tyk. Det indre Kammer indeholdende en mere eller mindre fast, kornet Masse. (Se Planchen Figg. 1—4).

Paa 2 Stationer meget vidt fra hinanden, nemlig Station 35 og Station 295 fandtes endel kugleformede eller ovale Klumper, i Regelen mere eller mindre dækkede af udstraalende Svampespikler, radiært kan det ialfald ikke altid kaldes, det ser meget mere ud som om de strittede ud til alle Kanter, idet nogle er temmelig lange, andre afbrukne et Stykke fra eller helt inde ved Roden, hvor de viser sig som en mørk Ring med en lys Prik i Midten. Disse Spikler har i det indre af Klumpens hvide, løse Vægge tabt sin Konsistens og fuldstændig smeltet sammen med det øvrige Materiale, ganske fint, glindsende Sand, til en kompakt Masse.

Det ydre har en skidden graa Kulør, modsat *Tholosina bulla*, der er mere hvidlig, og undertiden sees hvide skalfragmenter fastheftede til Ydervæggene. Brudfladerne derimod ligner aldeles paaafaldende *Tholosina bulla*.

Materialet er som før nævnt af en hvid Konsistens, dog sees paa nogle Exemplarer den yderste 3die Del eller Halvdelen af Væggens Gjennemsnit at være graa.

I Klumpees Indre sees der altid en mere eller mindre fast, kornet og gulbrun Masse. Undertiden danner denne en løs, af mange smaa Mellemlum afbrudt Substans, der fylder hele den indre Hulhed eller ogsaa viser den sig som en kompakt, afrundet Blok af et forholdsvis lidet Volum.

Paa to andre Stationer, nemlig 87 og 326, fandtes nogle andre Klumper, der adskiller sig fra de ovenfor omtalte derved at Svampespiklerne mangler, Væggenes Brud-

### Chrithionina abyssorum n. sp.

Spherical or oval, with uneven, gray surface, on which there are sometimes sponge spicules sticking out in all directions. Wall white, thick. The inner chamber containing a more or less firm, granular mass. (See plate, figs. 1—4).

At 2 stations, at a great distance from one another, namely Station 35 and Station 295, a number of spherical, or oval lumps were found, generally more or less covered with outward-streaming sponge spicules, which could not always, at any rate, be said to be radial; they appear rather to bristle out in all directions, some being long, others broken off a little way from, or close to the root, where they look like a dark ring with a light dot in the centre. In the interior of the white, loose partitions of the lump, these spicules have lost their consistency, and become completely merged in the other material, very fine, glittering sand, into a compact mass.

The exterior is of a dirty gray colour, unlike *Tholosina bulla*, which is whiter, and fragments of shell are sometimes seen attached to the outer walls. Fractured surfaces, on the other hand, bear a most striking resemblance to *Tholosina bulla*.

The material, as before mentioned, is of a white consistency, although in some specimens, the outermost  $\frac{1}{3}$  or  $\frac{1}{2}$  of the section of the wall is found to be gray.

In the interior of the lump there is always a more or less firm, granular, yellowish brown mass. Sometimes this is a loose substance, interrupted by a number of small intervals, and filling the entire inner cavity; or it appears in the form of a compact, rounded block of comparatively small bulk.

At 2 other stations, viz. 87 and 326: were found other lumps differing from those already mentioned, in the absence of sponge spicules, and in the fact that the frac-



flader er graa og den indre kornede Masse sort. Protoplasmaet i disse Klumper har rimeligvis i lang Tid været dødt og som Følge deraf er de nævnte Forandringer indtraadt.

I Proven fra Station 295 fandtes ogsaa Skaller af andre Thalamophorer, saaledes 2 Exemplarer af *Haplophragmium latidorsatum* og 1 af *Biloculina laevis* indkittede i Ydervæggen af en *Crithionina abyssorum*.

Goës beskriver fra Vestkysten af Centralamerika<sup>1)</sup> en nærstaaende Form, *C. rugosa*, der adskiller sig fra *C. abyssorum* ved sin rynkede Overflade og uregelmæssige Form.

### *Biloculina laevis* Defrance.

(Fig. 15—16).

*Pyrgo laevis* Defr., 1824, Dict. Sc. Nat. 32, p. 273.

„ — De Blainville, 1825, Manuel de Malacologie, p. 482, pl. LXII bis. fig. 2.

*Biloc. amphiconica* var. *platystoma* Reuss, 1867, Steinsaltzablag. Wieliczka. Wien. Ak. Sitz. Ber. 55, p. 67 pl. 1. fig. 8.

„ *ringens* Brady, 1884, Chall. Rep. 9. p. 137.

„ *depressa* „ — „ - „ - 140.

„ *laevis* „ — „ - „ - 146, pl. 2, fig. 14. (?).

„ Sarsi Schlumberger, 1891, *Biloc. grands fonds*, Mem. Soc. Zool. France 4, p. 166 pl. IX. fig. 55—59.

„ *laevis* Goës, A., 1892, Artic. and Scand. Foraminifera, K. Sv. Vet. Acad. Handl. Bd. 25 No. 9. p. 119, pl. XXIV. fig. 914—918.

Der synes at være forskjellige Meninger, om hvilken Art eller hvilke Arter det er, som har en saa kolossal Udredelse over Nordhavets Dybder, som Schmeleck angiver i sin Afhandling om Havbundens Afleiringer.

Baade Brady og Schlumberger har havt en Prøve af *Biloculina*er fra det norske Nordhav til Undersøgelse. Den første henfører Størsteparten af disse til *B. Ringens* og en Del til *B. Depressa*. Schlumberger har blot fundet 1 Art, hvilken han benævner *B. Sarsi*. Goës har i sit Materiale fra de store Havdyb ved Spidsbergen blot seet 1 Art, *B. laevis*<sup>2</sup>.

Brady og Goës er af den Anskuelse, at den fossile Art *Pyrgo laevis* Defrance er identisk med en nu paa de store Havdyb forekommende Form.

De væsentligste Invendinger mod denne Anskuelse synes mig at være:

<sup>1</sup> Goës, 1896, The Foraminifera, Rep. Dredg. Op. Albatross, XX. Bull. Mus. Comp. Zool. Harv. Coll. Vol. XXIX No. 1, P. 24, Pl. II, Fig. 3—4.

„ Jeg forbigaar her nogle andre Arter, som Goës opfører fra Havet ved Spidsbergen, nemlig *B. depressa*, *abyssorum* og *arctica*, dels fordi de let lader sig adskille fra *B. laevis*, dels fordi de ifølge Goës findes paa et mindre Dyb end denne Art.

tured surfaces of the wall are gray, and the interior, granular mass black. The protoplasm in these lumps has probably long been dead, and the above changes have taken place in consequence.

In the sample from Station 295, there were also shells of other Thalamophora e. g. 2 specimens of *Haplophragmium latidorsatum* and 1 *Biloculina laevis*, embedded in the outer wall of a *Crithionina abyssorum*.

Goës describes, from the west coast of Central America<sup>1</sup>, a nearly allied form, *C. rugosa*, which differs from *C. abyssorum* in its wrinkled surface and irregular form.

### *Biloculina laevis* Defrance.

(Fig. 15—16.)

*Pyrgo laevis* Defr., 1824, Dict. Sc. Nat. 32, p. 273.

„ — De Blainville, 1825, Manuel de Malacologie, p. 482, pl. LXII bis. fig. 2.

*Biloc. amphiconica* var. *platystoma* Reuss, 1867, Steinsaltzablag. Wieliczka. Wien. Ak. Sitz. Ber. 55, p. 67. pl. 1. fig. 8.

„ *ringens* Brady, 1884, Chall. Rep. 9. pr. 137.

„ *depressa* „ — „ - „ - 140.

„ *laevis* „ — „ - „ - 146, pl. 2, fig. 14. (?).

„ Sarsi Schlumberger, 1891, *Biloc. grands fonds*, Mem. Soc. Zool. France 4, p. 166 pl. IX. fig. 55—59.

„ *laevis* Goës, A., 1892, Arctic. and Scand. Foraminifera, K. Sv. Vet. Acad. Handl. Bd. 25 No. 9. p. 119, pl. XXIV. fig. 914—918.

There seems to be a difference of opinion as to which species it is that have such an exceedingly wide distribution in the North Sea depths as Schmeleck states in his treatise on the ocean bed deposits.

Booth Brady and Schlumberger have had a sample of *Biloculina* from the Norwegian North Atlantic, for the purpose of investigation. Brady refers the greater number of these to *B. ringens*, and a few to *P. depressa*. Schlumberger has only found one Species, which he calls *B. Sarsi*. Goës has only seen 1 species, *B. laevis*<sup>2</sup>, in his collection from the great ocean-depth at Spitzbergen.

Brady and Goës are of opinion that the fossil species, *Pyrgo laevis* Defrance, is identical with a form now occurring in the great ocean depths.

The chief objections to this view seem to me to be:

<sup>1</sup> Goës, 1896, The Foraminifera, Rep. Dredg. Op. Albatross XX. Bull. Mus. Comp. Zool. Harv. Coll. Vol. XXIX, No. 1, p. 24, Pl. II. figs. 3—4.

<sup>2</sup> I here pass over some other species, which Goës mentions from the sea near Spitzbergen, viz. *B. depressa*, *abyssorum* and *arctica*, partly because they are easily distinguished from *B. laevis*, partly because, according to Goës, they are found at a depth that is not so great as that at which the latter species is found.

I. *Pyrgo laevis* adskiller sig fra den ovennævnte recente Art ved en noget mere hvelvet Form.

II. *Pyrgo laevis* er blot fundet i de tertiære Afleiringer ved Paris, hvilke rimeligvis er dannede paa forholdsvis grundt Vand.

Hertil skal jeg bemærke følgende: Schlumberger har som bekjendt paavist, at der inden de enkelte Arter af Biloculiner findes en A-form og en B-form, der væsentlig adskiller sig fra hinanden ved de indre Kammeres Anordning. Af de mere end 100 Expl. af Biloculiner fra det norske Nordhav, gennem hvilke jeg har gjort Snit for at kunne se deres indre Bygning, har jeg væsentlig fundet A-formen og sjældnere B-formen. Denne sidste adskiller sig fra A-formen ialmindelighed ogsaa ved enkelte ydre Kjendetegn, nemlig ved en noget betydeligere Størrelse, mere hvelvede segmenter og mindre stærkt fremtrædende Kjøl, egenskaber, som denne B-form har tilfælles med *Pyrgo laevis*. Dog skal det bemærkes, at *Pyrgo laevis* ogsaa synes at have mere hvelvede Segmenter end B-formen. Paa den anden Side er der en anden fossil Art *Biloculina amphiconica* Reuss, fundet i de tertiære Afleiringer ved Wien, der saa afgjort ligner A-formen fra det norske Nordhav, at der her ikke længer kan være Tale om, at skjelne mellem fossile og recente Arter. Rimeligvis har saaledes De France fundet B-formen og Reuss A-formen af en og samme Art, der altsaa endnu lever paa de store Dyb i de arktiske Have.

Schlumbergers *B. Sarsi* og Goës's *B. laevis* kan paa ingenomhelst Maade skilnes fra hinanden, hvad disse Forfatteres Afbildninger og Beskrivelser godtgjør. Af de tidligere fremførte Grunde mener jeg, at man er berettiget til at benævne den i Nordhavet fundne Form *Biloculina laevis*.

De af Brady i det nordlige Atlanteohav fundne Exemplarer af *B. laevis* synes at være meget abnormt dannede, hvis de overhovedet kan henføres til denne Art. Blandt alle de Biloculiner fra det norske Nordhav, som jeg har havt til Undersøgelse, har jeg ikke fundet et eneste Exemplar, der endog tilnærmelsesvis ligner de af Brady afbildede Exemplarer af *B. laevis*. De er ogsaa alle dannede efter en ganske anden Formtypus end Bradys Exemplarer. Hos disse sidste kan man ifølge Brady tydelig skjelne mellem 2 ligeløbende Kjøle, idet de 2 sidste Segmenters Bremmer er frie. Hos Nordhavsekspeditionens ligesom ogsaa hos Goës's Exemplarer er altid<sup>1</sup> det sidste Segments Rand voxet udover den yderste Rand af det næstsidste Segment, saaledes at denne er fuldstændig skjult. Kort sagt, Bradys Exemplarer er 2-kjølede, medens de i Nordhavet fundne er 1-kjølede. *Pyrgo laevis* synes ogsaa at være 1-kjølet, hvad Blainvilles Tegning ikke aldeles tydelig viser, ialfald synes det næst sidste Segments Rand at være dækket af det sidste Segment. Hvad der paa Tegningen synes at danne en Kjøl No. 2, er rimelig-

I. *Pyrgo laevis* differs from the above mentioned recent species in having a more vaulted shape.

II. *Pyrgo laevis* is only found in the tertiary deposits near Paris, which have probably been formed in comparatively shallow water.

To this I will add that Schlumberger, as is well known, has shown that in the different species of *Biloculina*, there is an A-form and B-form, which differ from one another principally in the arrangement of the inner chambers. Out of the 100 or more *Biloculina* specimens from the Norwegian North Atlantic of which I have made sections to enable me to see their internal structure. I have principally found the A-form, and less frequently the B-form. The latter also generally differs from the A-form in certain external distinguishing features, more especially in its somewhat larger size, its more vaulted segments, and its less strongly marked keel, features which this B-form has in common with *Pyrgo laevis*. I must, however, be observed that *Pyrgo laevis* also seems so have more vaulted segments than the B-form. On the other hand, another fossil species, *Biloculina Amphiconica* Reuss, was found in the Tertiary deposits at Vienna, bearing such a strong resemblance to the A-form from the Norwegian North Atlantic, that there can be no longer any question here of distinguishing between fossil and recent species. It is thus probable that De France has found the B-form and Reuss the A-form of the same species, which thus still lives at great depths in the Arctic Ocean.

Schlumberger's *B. Sarsi* and Goës's *B. laevis* can in no way be distinguished from one another, a fact which is proved by the illustrations and descriptions of the above-named writers. For reasons already given, I consider it justifiable to designate the form found in the North Sea, *Biloculina laevis*.

The specimens of *B. laevis* found by Brady in the North Atlantic, seem to be of a very abnormal formation, if indeed they can be placed in this species at all. Among all the *Biloculina* from the Norwegian North Atlantic, which I have had for investigation, I have not found a single specimen which resembles even approximately the specimens of *B. laevis* figured by Brady. They are also all formed after an altogether different type form to that of Brady's specimens. In the latter according to Brady, it is easy to distinguish between the two parallel keels, the rims of the last two segments being free. In the North Atlantic Expedition, and also in Goës's, the margin of the last segment has always<sup>1</sup> grown out over the extreme margin of the penultimate segment, so as to hide it completely. In short, Brady's specimens have 2 keels, while those found the North Atlantic have 1 keel. *Pyrgo laevis* also seems to have 1 keel, a circumstance which is not shown at all clearly in Blainville's drawing. At any rate, the margin of the penultimate segment seems to be covered by the last segment. What appears in the

<sup>1</sup> Paa fig. 915 hos Coës kan det ikke bestemt afgjøres om der her ikke foreligger et 2-kjølet Exemplar. En Slibning er her nødvendig.

<sup>1</sup> In Goës's fig. 915 it cannot be certainly determined whether the specimen represented may not be double-keeled. A section is required here.



vis blot Afslutningen af det sidste Segments omboiede Rand.

### ***Bigenerina Sarsi* n. sp.**

Fig. 5—6.

Af Sand; mere eller mindre sammentrykt, tungeformet eller næsten aflangt triangulær, Spiralen 4—6-kamret, Aabningen som hos *Textularia*; skiddengraa.

Som bekjendt er der inden Slægten *Biloculina* paa vist Tilstedeværelsen af en A-form og en B-form, der tilsammen danner ea Art. Der findes ogsaa inden *Bigenerina Sarsi* 2 konstante Former, der har saa mange Egenskaber fælles, at de knapt kan karakteriseres som 2 særegne Arter, desuden frembyder de i sin indre Bygning megen Lighed med den Daanelsemaade, der ligger til Grund for de saakaldte A- og B-former hos *Biloculina*.

A-formen begynder med et forholdsvis stort Embryonalkammer, der har en Vidde af 0.06 mm. De fire følgende Kamre tiltager raskt i Størrelse og afslutter Spiralen, hvorpaa den biseriske Bygningsmaade begynder med smale og aflange Kamre, der efterhaanden voxer betydeligt i Vidde, men derimod forholdsvis ubetydeligt i Længde. 0.52 mm. Station 192.

B-formen har et meget mindre Embryonalkammer end A-formen. Det har nemlig blot en Vidde af 0.024. Spiralen dannes af 5—6 Kamre, der er forholdsvis ligesaa ubetydelige som det første Kammer. De følgende Kamre tiltager langsomt saavel i Vidde som i Længde. De er meget talrigere end hos A-formen, hvorfor ogsaa B-formen opnaar en langt betydeligere Størrelse end A-formen. 0.92 mm. Station 255.

### ***Lagena lucida* Will.**

Af denne Art fandtes et typisk Exemplar i Bundprøven fra Station 192. Tidligere har jeg i noget Materiale fra den norske Kyst, som Cand. Nordgaard sendte mig, fundet et par Exemplarer af en Varietet, hvilken jeg i Bergens Museums Aarbog for iaar<sup>1</sup> har beskrevet under Betegnelsen *Lagena Nordgaardi* nov. var. Disse Exemplarer er næsten kugleformede, medens Exemplaret fra Nordhavsexpeditionen er aflangt og fladtrykt paa Siderne. Alle disse Exemplarer viser den karakteristiske Hestekoformede Fortykkelse paa begge Sider af Kjolen. Denne Fortykkelse er meget lidet ophøiet og deri samt i Mundaabningens Form og Beliggenhed adskiller disse Exemplarer sig fra *Lagena fasciata* Egg. (Reuss, 1862, Die Foraminiferen-Familie der Lagenideen, Sitz. Ber. Akad. Wiss. Wien. Bd. XLVI, 1 Abt. p. 323, Pl. 2, fig. 24).

### **Thalamophorernes geografiske Udbredelse.**

Søger man at faa et Overblik over Thalamophorernes Forekomst over alle de af Nordhavsexpeditionen undersøgte

drawing to be a second keel is probably only the termination of the backward-curved margin of the last segment

### ***Bigenerina Sarsi* n. sp.**

Figs. 5—6.

Of Sand; more or less compressed, lingulate or almost an acute-angled triangle, the spirial 4--6-chambered, opening as in *Textularia*; of a dirty gray colour.

The presence of an A-form and a B-form, as is well known, has been demonstrated in *Biloculina*, the two forms making one species. In *Bigenerina Sarsi* there are 2 constant forms, which have so many characters in common, that they can scarcely be defined as 2 different species. Moreover, in their internal structure, they exhibit a great resemblance to the mode of development which is the foundation of the so-called A and B forms in *Biloculina*.

The A-form begins with a comparatively large embryonal chamber, with a width of 0.06 mm. The 4 succeeding chambers increase rapidly in size and terminate the spiral, whereupon the bi-serial mode of structure begins with narrow, oblong chambers, which gradually grow to a considerable width, but, on the other hand, are of no great length. 0.52 mm. Station 192.

The B-form has a much smaller embryonal chamber than the A-form, having a width of only 0.024 mm. The spiral is formed of 5 or 6 chambers, which are relatively as small as the first. The next succeeding chambers increase slowly both in width and length. They are much more numerous than in the A-form, so that the B-form attains to a far larger size than the A-form — 0.92 mm. Station 255.

### ***Lagena lucida* Will.**

A typical specimen of this species was found in the bottomsample from Station 192. I had previously found, among some specimens from the Norwegian coast, sent me by Mr. Nordgaard, a few specimens of a variety which I have described in the Bergen Museum Year-book for 1899<sup>1</sup> under the name *Lagena Nordgaardi*, nov. var. These specimens are almost spherical, while the specimen from the North Atlantic Expedition is oblong and compressed at the sides. All these specimens show the characteristic horse-shoe-shaped thickening on both sides of the keel. This thickening is of no great elevation. Together with the shape and position of the opening, it separates these specimens from *Lagena fasciata* Egg. (Reuss, 1862, Die Foraminiferen-Familie der Lagenideen, Sitz. Ber. Akad. Wiss. Wien. Vol. XLVI, 1 Abt. p. 323, Pl. 2, fig. 24).

### **The Geographic Distribution of the Thalamophora.**

In taking a survey of the occurrence of Thalamophora in all the ocean-depths investigated by the North Atlantic

<sup>1</sup> Report on Norwegian marine investigations.

<sup>1</sup> Report on Norwegian marine investigations.



Havdyb, lader der sig i det store og hele adskille 3 forskellige Udbredelsescentre, nemlig:

A. Det sydlige graa Ler, der omfatter Fjordene og Bankerne langs Norges Kyst omtrent til 19° Ø. L. samt det graa ler ved Island og Jan Mayen.

B. Det nordlige graa Ler, hvortil hører Fjordene og Bankerne langs Norges Kyst østenfor 19° Ø. L., ved Beeren Eiland og Spidsbergen samt Rhabdamminaleret.

C. Det brune Ler, der deles i det egentlige Biloculina samt Overgangsleret.

Specielt adskiller Biloculina sig fra det graa Ler i den Grad, at af de Arter, der er fundne paa den første Lersort er blot ca.  $\frac{2}{3}$  fælles for begge. Af disse  $\frac{2}{3}$  af Arter, der er fælles, har mange egentlig blot hjemme paa den ene Lersort og er blot enkeltvis fundne paa den anden.

Sognefjorden danner sammen med de øvrige dybe Fjorde i det vestlige Norge et eget Distrikt, hvis Fauna karakteriseres ved Forekomsten af enkelte større, mere iøjnefaldende Former som *Saccamina sphaerica*, *Bathysiphon filiformis*, *Rhabdammina abyssorum* og dens Følgesvend *Tholosina bulla*, endvidere *Stortosphaera albida* og *Hyperammina ramosa*. Nogle af de i Sognefjorden fundne Thalamophorer synes her at have Grænsen for sin Udbredelse mod Nord. Disse er: *Stortosphaera albida*, *Bathysiphon filiformis*, *Gordiammina charoides* og *Aschemonella catenata*.

*Saccamina sphaerica* forekommer i saadan Mængde paa de store Dyb i enkelte af de vestlandske Fjorde, at man kunde være fristet til at kalde det Mudder, hvori denne Dyreart lever, *Saccaminamudder* i Modsætning til det graa Ler paa Kystbankerne. Imidlertid synes dette Forhold ikke at være Tilfældet med Sognefjorden, da den eneste Prøve fra Skrabningerne i denne Fjord indeholder forholdsvis faa Exemplarer af *Saccamina sphaerica*, men derimod særdeles mange af *Rhabdammina abyssorum*. Dog kan Sognefjordens Mudder ikke kaldes *Rhabdamminamudder*, da det savner den graagrønne Kulor, som er eiendommeligt for denne Lersort.

Det graa Ler langs Norges Kyst er med Undtagelse af den østlige Del rigt paa Thalamophorer, idet der her er fundet næsten Halvdelen af alle fra Norhavsekspektionens materiale opførte Arter. De undersøgte Bundprøver er tagne paa ca. 100—400 Favnes Dyb, hvilket er Grunden til at enkelte Arter, der har hjemme paa ganske grundt Vand f. Ex. *Rotalia beccari*, ikke er komne med. De almindeligst forekommende Arter er: *Uvigerina pygmaea* og *angulosa*, *Truncatulina lobatula* og *refulgens*, *Nonionina umbilicatula* og *scapha*, *Lagena marginata*, *Pullenia sphaeroides*, *Quinqueloculina seminulum*, *Globigerina bulloides*, *Bolivina dilatata*, *Bulimina elipsoidea* og *marginata*, samt *Cassidulina laevigata*<sup>1</sup>. *Uvigerina pygmaea* er især talrig tilstede paa de sydligere Dele af det graa Ler, saa man

Expedition we find, in all, 3 different centres of distribution viz:

A. The southern gray clay, which includes the fjords and banks along the Norwegian coast, about as far as to 19 E. Long., and the gray clay near Iceland and Jan Mayen Island.

B. The northern gray clay, to which the fjords and banks along the Norwegian coast east of 19 E. Long., near Bear Island and Spitzbergen belong, and the *Rhabdammina* Clay.

C. The brown clay, which is divided into the *Biloculina* Clay, proper, and the Transition Clay.

The *Biloculina* Clay, in particular differs to such an extent from the gray clay that of the species found in the firstnamed clay, only about  $\frac{2}{3}$  are common to both. Of these  $\frac{2}{3}$  many have their home only on the one kind of clay, and are found very rarely on the other.

Sognefjord, together with the other deep fjords of Western Norway, forms a special district, whose fauna is characterised by the occurrence of a few larger, more conspicuous forms, such as *Saccamina sphaerica*, *Bathysiphon filiformis*, *Rhabdammina abyssorum* and its companion, *Tholosina bulla*, *Stortosphaera albida* and *Hyperammina ramosa*. Some of the Thalamophora found in the Sognefjord appear to have the northern limit for their distribution in this fjord. These are *Stortosphaera albida*, *Bathysiphon filiformis*, *Gordiammina charoides* and *Aschemonella catenata*.

*Saccamina sphaerica* occurs in such numbers in the great depths of some of the fjords of the west coast, that one is tempted to call the mud in which this species of animal lives — *Saccamina* mud, as opposed to the gray clay on the coast banks. This, however, does not seem to be the case in the Sognefjord, as the one sample from dredgings in this fjord contained comparatively few specimens of *Saccamina sphaerica*, but, on the other hand, very many of *Rhabdammina abyssorum*. The mud of the Sognefjord, however, cannot be called *Rhabdammina* mud, as the gray-green colour peculiar to this kind of clay, is absent.

The gray clay along the coast of Norway, with the exception of the eastern part, is rich in Thalamophora, almost half of the species mentioned from the North Atlantic Expedition collection having been found there. The bottom-samples examined were taken at a depth of from about 100 to 400 fathoms, which accounts for the fact that certain species, which have their homes in quite shallow water — e. g. *Rotalia beccari* — are not among them. The species most commonly occurring are *Uvigerina pygmaea* and *angulosa*, *Truncatulina lobatula* and *refulgens*, *Nonionina umbilicatula* and *scapha*, *Lagena marginata*, *Pullenia sphaeroides*, *Quinqueloculina seminulum*, *Globigerina bulloides*, *Bolivina dilatata*, *Bulimina elipsoidea* and *marginata*, and *Cassidulina laevigata*<sup>1</sup>. *Uvigerina pygmaea*

<sup>1</sup> Disse Arter findes oftest i mange Exemplarer i hver af de i Tabellen angivne Bundprøver.

<sup>1</sup> Numerous specimens of these species will generally be found in each of the bottom-samples given in the table.

kunne have Grund til at kalde denne Strækning *Uvigerinaler*, især da denne Art her opnaar en betydelig Størrelse, medens den paa de nordlige og østlige Dele oftest er forholdsvis sjelden og degeneret.

Det graa Ler ved Jan Mayen og Island synes i det store og hele at have samme Karakter som Leret ved Norges Kyst. At en Art mangler snart her snart der beror vel oftest paa en Tilfældighed og berettiger saaledes ikke til at drage faste Slutninger med Hensyn til Arternes Udbredelse. Mange *Thalamophorer* er jo meget sparsomt repræsenteret paa de enkelte lokaliteter og kan vel ogsaa ved et Tilfælde oversees ialfald de ubetydelige og mindre iøjnefaldende Arter.

Som tidligere bemærket, har jeg delt det graa Ler i 2 forskellige Udbredelsescentre. Det nordlige af disse Centre udmærker sig nemlig ved Forekomsten af nogle arktiske Former, der enten mangler eller ialfald optræder langt sparsommere paa det Omraade, der hører til det sydlige Centrum. Som saadanne kan nævnes: *Astrorhiza crassatina*, *Lagena apiculata*, *Pulvinulina Karstenii*, og *Globigerina pachyderma*. Paa den anden Side er der endel sydlige Arter, der inden det nordlige Centrums omraade enten aldeles mangler eller ialfald forekommer meget sparsomt og uden at opnaa sin fulde Størrelse, f. Ex. *Bulimina marginata*, *Uvigerina pygmaea* og *angulosa*, *Operculina ammonoides*. Forøvrigt synes *Thalamophorfaunaen* over hele det graa Ler at være meget ensformig.

*Rhabdamminaleret*. Hvad der især karakteriserer denne Lersort er foruden dens graagrønne Kulør tillige dens Overflod paa Exemplarer af *Rhabdammina abyssorum*. Af de hyppigst forekommende *Thalamophorer* kan nævnes: *Tholosina bulla*, *Cassidulina laevigata*, *Truncatulina lobatula* og *refulgens*, *Pulvinulina Karstenii*, *Nonionina umbilicatula*, *Quinqueloculina seminulum* og *tricarinata*. Forresten synes de enkelte Arter ialmindelighed at forekomme meget spredt og i ringe Antal paa hver Lokalitet. Slægterne *Lagena* og *Biloculina*, der ellers ialmindelighed er godt repræsenteret, udmærker sig her ved sin Fattigdom paa Arter og Exemplarer.

*Globigerina bulloides*, *pachyderma* samt talrige Overgangsformer mellem disse to Arter er almindelige over hele det graa Ler. Paa den sydlige Del af Omraadet, specielt langs den norske Kyst synes de fleste Exemplarer at høre til *Gl. bulloides* og de nævnte Overgangsformer, medens *Gl. pachyderma* især er almindelig paa *Rhabdamminaleret* og ved Spidsbergen.

Overgangsleret er overordentligt rigt paa *Thalamophorer*. Specielt har jeg i en enkelt Bundprøve (fra Station 192) fundet en usædvanlig Mængde Arter, nemlig over Halvparten af samtlige i Nordhavsexpeditionens Materiale forekommende Arter. Grunden til dette rige Dyreliv er vel den, at saavel de paa det grundere Vand som de paa Havets Dybder levende Dyreformer her blander

is present in particularly large number in the southern portion of the gray clay, so that one might be tempted to call this region *Uvigerina Clay*, especially as that species here attains a considerable size, while in the northern and eastern parts it is often comparatively rare and degenerated.

The gray clay near Jan Mayen Island and Iceland, seems, on the whole, to have the same character as the clay on the Norwegian coast. That a species is absent now in one place, now in another, must generally be due to chance, and therefore does not justify the drawing of decided conclusion with regard to the distribution of the species. Many *Thalamophora*, indeed, are very poorly represented in certain localities, and may even happen to be overlooked, at any rate smaller and less conspicuous species.

As previously mentioned, I have divided the gray clay into 2 different centres of distribution. The more northerly of these two centres is characterised by the occurrence of some arctic forms, which are either absent, or at any rate appear far less frequently, in the region belonging to the southern centre. Among these may be named *Astrorhiza crassatina*, *Lagena apiculata*, *Pulvinulina Karstenii* and *Globigerina pachyderma*. On the other hand there are some southern species which are either altogether absent from the field of the northern centre, or at any rate are very scarce, and do not attain to their full size, e. g. *Bulimina marginata*, *Uvigerina pygmaea* and *angulosa*, *Operculina ammonoides*. Moreover, the *Thalamophora* fauna throughout the gray clay, seems to be very homogeneous.

The *Rhabdammina Clay*. That which, in addition to its gray green colour, especially characterises this kind of clay, is its superabundance of specimens of *Rhabdammina abyssorum*. Among the *Thalamophora* most frequently occurring, we may name *Tholosina bulla*, *Cassidulina laevigata*, *Truncatulina lobatula* and *refulgens*, *Pulvinulina Karstenii*, *Nonionina umbilicatula*, *Quinqueloculina seminulum* and *tricarinata*. The different species appear generally to be very scarce, and in small numbers at each locality. The genera *Lagena* and *Biloculina*, which are elsewhere well represented, are here characterised by their poverty of species and specimens.

*Globigerina bulloides*, *pachyderma*, and numerous transition forms between these two species are general throughout the gray clay. In the southern portion of the region, especially along the Norwegian coast, most of the specimens seem to belong to *Gl. bulloides* and the above-mentioned transition forms, while *Gl. pachyderma* is especially common in the *Rhabdammina Clay* and off Spitzbergen.

The transition clay is exceedingly rich in *Thalamophora*. In one sample (from Station 192), I have found an unusual number of species, that is to say, more than half the species occurring in the North Atlantic Expedition collection. The reason for this luxuriant animal life is probably that the animal forms, both in the shallower water, and in the ocean depths, mingle here, and find the



sig og finder gunstige existensbetingelser. Foruden de i Bundproverne fra det graa Ler og fra Biloculinaleret observerede Arter, er her fundet enkelte sydlige Former som *Ophthalmidium tumidulum*, *Thurammina papillata*, *Trochammina squamata*, *Ammodiscus tenuis*, *Textularia Williamsoni*, *Nodosaria mucronata*, *Vaginulina costata* og *linearis*, *Patellina corrugata*, *Triloculina trigonuta*, *Quinqueloculina angulata*, *Lagena curvilineata*, *alveolata*, *Planorbulina mediterranea*, *Pulvinulina concentrica*, *Discorbina rosacea*.

Biloculinaleret er saa udtømmende behandlet af Schmelck, at jeg her væsentlig blot behøver at henvise til hans Afhandling. Her skal blot nævnes de paa Biloculinaleret og Overgangsleret almindeligst forekommende Arter. Som saadanne kan nævnes *Biloculina laevis*, *Globigerina bulloides* og *pachyderma*, *Haplophragmium latidorsatum*, *Truncatulina Wüllersdorfi*, *Rotalia orbicularis* samt *Lagena apiculata*. Det brune Ler synes at have en meget ensformig Fauna. Vistnok er der endel Arter, der ikke findes paa den nordlige Del af denne Lersort, men forøvrigt er der meget liden Forskjel inden dens enkelte Dele. Overgangsleret adskiller sig væsentlig fra Biloculinaleret ved Forekomsten af Arter, der egentlig har hjemme paa forholdsvis grundt Vand. Den østlige Del af det brune Ler har ingen særegen Fauna. Dog er her *Rhabdammina abyssorum* fundet enkeltvis paa nogle faa Stationer.

*Biloculina laevis* findes over hele denne Area<sup>1</sup>, men er aldrig meget talrig paa hver enkelt Lokalitet, medens de forskellige *Globigerina* Arter altid er tilstede i stor Mængde. Hovedmassen dannes af *Globigerina pachyderma*, der forekommer i store, smukke Exemplarer, medens *Glob. bulloides* og Overgangsformerne, hvilke ogsaa er meget talrige, synes at være smaa og lidet udviklede.

Fra de store Havdyb og ind mod Kysterne aftager *Globigerina*erne jævnt i Antal, indtil de nær land og inde i fjordene omtrent er forsvundne.

<sup>1</sup> Det brune Ler i det hele taget.

conditions of existence favorable. In addition to the species from the gray clay and from the *Biloculina* Clay, observed in the samples, a few southern forms are found such as, *Ophthalmidium tumidulum*, *Thurammina papillata*, *Trochammina squamata*, *Ammodiscus tenuis*, *Textularia Williamsoni*, *Nodosaria mucronata*, *Vaginulina costata* and *linearis*, *Patellina corrugata*, *Triloculina trigonula*, *Quinqueloculina angulata*, *Lagena curvilineata*, *alveolata*, *Planorbulina concentrica*, *Discorbina rosacea*.

The *Biloculina* Clay has been so exhaustively treated of by Schmelck, that I need really only refer the reader to his paper. I will only name the most generally occurring species in the *Biloculina* Clay and the Transition Clay. Among these may be named *Biloculina laevis*, *Globigerina bulloides* and *pachyderma*, *Haplophragmium latidorsatum*, *Truncatulina Wüllersdorfi*, *Rotalia orbicularis* and *Lagena apiculata*. The brown clay appears to have a very homogeneous fauna. It is true, there are a few species which are not found in the northern portion of this kind of clay, but beyond that, there is very little difference between its separate parts. The Transition Clay differs principally from the *Biloculina* clay in the occurrence of species which really inhabit comparatively shallow water. The eastern part of the brown clay has no special fauna, but the *Rhabdammina abyssorum* is found occasionally at a few stations.

*Biloculina laevis* is found over the whole of this area<sup>1</sup>, but is never very numerous in any one locality, while the various *Globigerina* species are present in great numbers. The bulk of them is made up of *Globigerina pachyderma*, of which large and beautiful specimens are found, while *Glob. bulloides* and the transition forms, which are also very numerous, seem to be small and not greatly developed.

From the great depths of ocean and in towards the coast the *Globigerina* decrease in number, until they almost disappear near the shore and in the fjords.

<sup>1</sup> The brown clay generally.



## Forklaringen til planchen. Description of the plate.

Fig. 1—4.	<i>Crithionina abyssorum</i> n. sp.		Fig. 12—14.	<i>Triloculina valvularis</i> .
.. 5.	<i>Bigenenerina Sarsi</i> n. sp. B-form.		.. 15.	<i>Biloculina laevis</i> , B-form.
.. 6.	— " - " A-form.		.. 16.	" " A-form.
.. 7.	<i>Globigerina</i> sp., station 317, 1 Expl.		.. 17.	<i>Polymorphina</i> sp., station 192.
.. 8.	<i>Lagena sulcata</i> var. a. orale pol. b. aborale pol.		.. 18—19.	<i>Vaginulina costata</i> .
.. 9.	<i>Lagena sulcata</i> var.		.. 20.	<i>Nodosaria pauperata</i> .
.. 10.	" " (abnorm).		.. 21.	<i>Lagena</i> sp.
.. 11.	" " —			







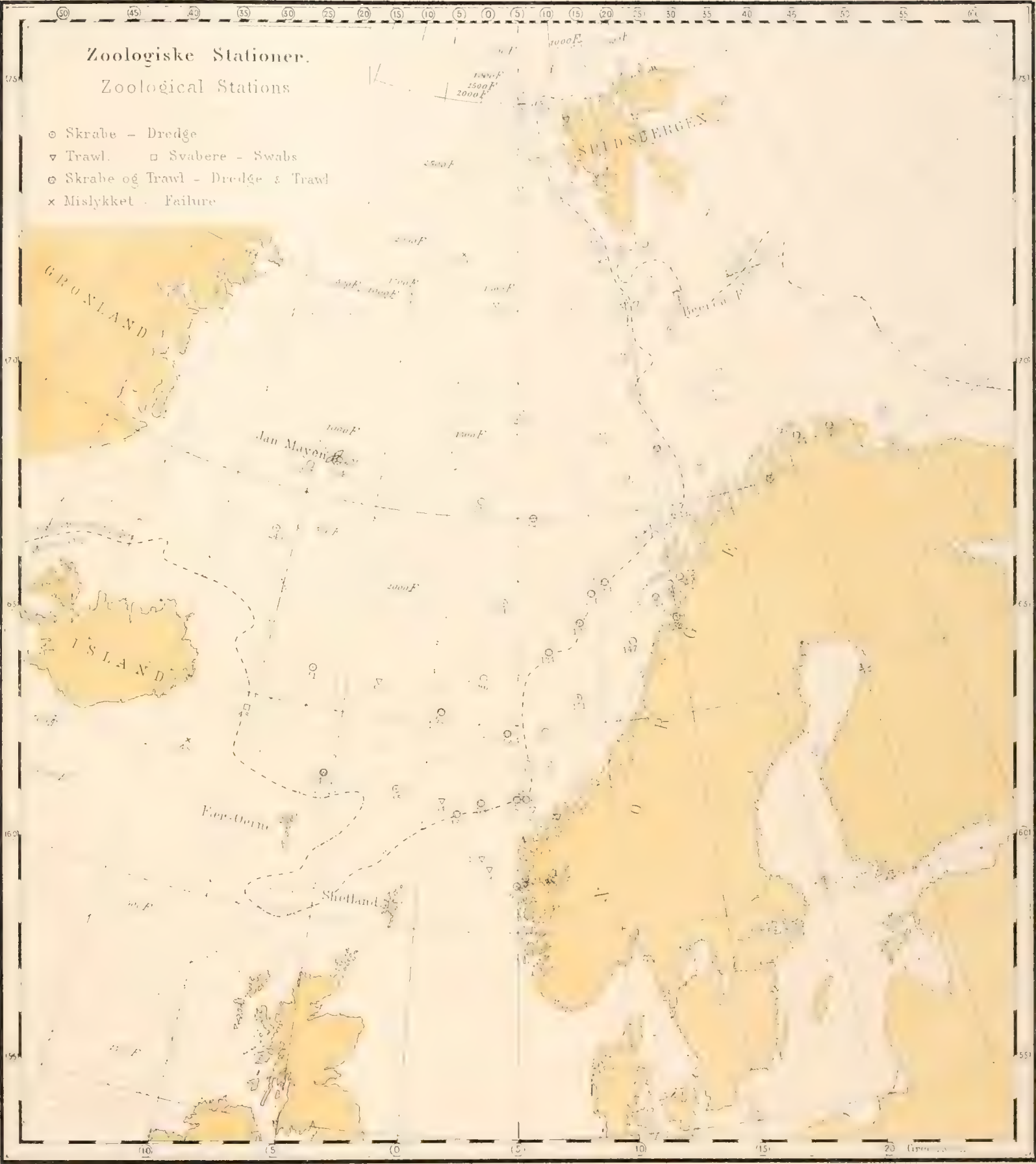
## Trykfeil og Rettelser.

Pag.	1,	Linie	11	fra oven tilføi:	Se Prof. Mohns Kart over Nordhavets Dybder (H. Mohn, Nordhavets Dybder, Temperatur og Strømninger, 1887. Den norske Nordhavsexpedition).
„	1,	„	16—19	fra oven staar:	Spidsbergen, Jan Mayen, Island, Færøerne, læs: ved Spidsbergen, ved o. s. v.
„	8,	„	21	- neden „ :	Udaredelse, læs: Udbredelse.
„	9,	„	34	- oven „ :	Atlantøhav, læs: Atlanterhav.
„	13,	„	7	- neden „ :	Exemplarer, læs: Exemplarer (0.3 mm).
„	7,	„	9	- „ „ :	Klumpees, læs: Klumpens.
„	7,	„	17	- oven „ :	Chrithionina, læs: Crithionina.

## E r r a t a.

Pag.	1,	line	11	from the top, add:	„Look: Chart of the Depths of the Northern Ocean (H. Mohn, The Northern Ocean, Its Depths, Temperature and Circulation. The Norwegian North Atlantic Expedition).
„	1,	„	15	„ - „ for	„24“ read „34“.
„	2,	„	4	„ - bottom -	„umilicatula“ read „umbilicatula“.
„	7,	„	17	„ - top -	„Chrithionina“ read „Crithionina“.
„	8,	„	33	„ - „ -	„North Sea“ read „North Atlantic“.
„	9,	„	18	„ - „ -	„1“ read „It“.
„	13,	„	7	„ - bottom -	„specimens“ read „specimens (0.3 mm).











DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

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ZOOLOGI.

MOLLUSCA III.

VED

HERMAN FRIELE og JAMES A. GRIEG.

MED TO TEXTFIGURER OG ET KART.



---

CHRISTIANIA.

GRØNDAHL & SØNS BOGTRYKKERI.

1901.



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WITH TWO FIGURES AND A MAP.



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Naar den norske Nordhavsexpeditions „mollusker“ først nu kan faa sin afslutning, har dette sin grund i at andre gjøremaal saa stærkt har optaget min tid og tvunget mig at udsætte fra aar til andet med tilendebringelsen af arbeidet.

Vistnok har samlingerne ligget bestemte og ordnede, men til en ny kritisk gennemgaaelse af især de mindre arter, vil ikke længer mine øine gjøre mig fuld tjeneste, jeg har derfor formaaet min nevø, konservator James A. Grieg, at være min medarbeider i dette afsluttende arbeide.

*Bergen i april 1901.*

Herman Friele.

Første bind af Nordhavsexpeditionens mollusker omhandler *buccinidæ*, andet bind slægten *bela* samt nogle dels sjældnere, dels for videnskaben nye arter. I dette bind gives en faunistisk oversigt over samtlige paa expeditionen tagne arter med oplysninger om deres horizontale og vertikale udbredelse.

Angaaende udbredelsen maa vi gjøre opmærksom paa at mange forfattere ikke angiver, hvorvidt de har havt levende eller døde eksemplarer for sig. Vi er derfor ved flere leiligheder i tvil om den horizontale eller den vertikale udbredelse er saa nøiagtig som ønskeligt, thi det er ikke til dyrlevningernes udbredelse, men til det levende dyrs at interessen særlig knytter sig. Flere nordiske arter har saaledes vistnok faaet en altfor stor horizontal udbredelse; andre former staar derimod angivet med dybder, som neppe kan gjælde levende eksemplarer. Naar vi i det

Den norske Nordhavsexpedition: H. Friele & J. A. Grieg.

That the ‘Mollusca’ of the Norwegian North Atlantic Expedition has only now been brought to a conclusion, is accounted for by the fact that other duties have occupied me and obliged me to defer the conclusion of my work from year to year.

The collections, it is true, have long been determined and arranged, but my eyes will no longer serve me completely for a new critical study of the species, especially the smaller ones. I have therefore prevailed on my nephew, Curator James A. Grieg, to be my collaborator in this concluding labour.

*Bergen. April, 1901.*

Herman Friele.

The first volume of the Mollusca of the North Atlantic Expedition treats of the *Buccinidæ*, and the second volume of the genus *Bela*, and some species that are either rare or new to science. In this volume, a faunistic survey is given of all the species taken during the expedition, with information respecting their horizontal and vertical distribution.

With regard to the distribution, we must point out that many authors do not state whether their specimens were living or dead. On several occasions, therefore, we are in doubt as to whether the horizontal or the vertical distribution is as exact as could be desired; for it is not to the distribution of animal remains, but to that of the living animal, that special interest attaches. To several Scandinavian species, far too wide a horizontal distribution has thus certainly been assigned, while on the other hand, other forms are given with depths that can scarcely apply

Mollusca III.



følgende kommer at omtale en del stationer udenfor den norske kyst og fra de større dyb i Grønlandshavet, vil man se, at det kan have den største betydning at være stræng kritisk i angivelsen af enten man har havt levende eller døde skaller for sig.

Med hensyn til nomenclaturen og synonymien har vi for de fleste arters vedkommende indskrænket os til at angive det arbejde, hvor arten første gang blev beskrevet samt nogle af de vigtigere værker, hvor den er omtalt. Kun hvor der hersker konfussion angaaende nomenclaturen har vi for nærmere at præcisere vor opfatning leveret en udførligere synonymiliste.

Paa den norske Nordhavsexpedition fandtes:

Brachiopoda . . .	8 arter		
Pelecypoda . . .	108 „	med 9	varieteteter.
Scaphopoda . . .	8 „		
Placophora . . .	10 „		
Gastropoda . . .	192 „	„ 31	„
Nudibranchiata .	22 „		
Pteropoda . . .	5 „		
Cephalopoda . . .	7 „		

For vi nærmere omhandler de paa expeditionen fundne arter, vil vi omtale nogle stationer, som har særlig interesse, dels paa grund af sin rigdom paa arter, dels paa grund af forekomster af dyrelevninger paa eiendommelige dyb.

Allerede paa det skandinaviske naturforskermode i Christiania i 1844 henledede professor Rasch opmærksomheden paa det rige dyreliv paa fiskebankerne udenfor Aalesund. Senere har professor G. O. Sars i „Bidrag til Kundskaben om Dyrelivet paa vore Havbanker“<sup>1)</sup> nærmere redegjort for de dyreformer, som holder til paa bankerne udenfor Aalesund og Christiansund.

Et lignende og endnu rigere dyreliv lykkedes det Nordhavsexpeditionen at paavise paa bankerne udenfor det nordlige Norge. De rigeste lokaliteter var station 195, 107 fv., paa banken nord for Senjen, samt station 173 b, 300 fv. og station 192, 649 fv., vest af Senjen, begge paa bankens afheld mod dybet.

Arter (Species).	Stat.		
	195, 107 fv.	173 b, 300 fv.	192, 649 fv.
<i>Neatria gnomon</i> , Jeffr. . . . .			†
<i>Terebratulina septentrionalis</i> , Couth. .	†	†	
<i>Waldheimia cranium</i> , Müll. . . . .	†	†	†
<i>Anomia ephippium</i> var. <i>squamula</i> . .			†
<i>Lima loscombii</i> , Sow. . . . .			†
„ <i>subovata</i> , Jeffr. . . . .	†	†	†
„ <i>sarsii</i> , Lov. . . . .	†	†	†

<sup>1)</sup> Christiania Vid. Selsk. Forhandl. 1872, p. 73.

to living specimens. When we come to speak in these pages of certain stations off the Norwegian coast and in the greater depths of the Greenland Sea, it will be seen how great is the importance of a severely critical statement as to whether the specimens mentioned were alive or dead.

With regard to the nomenclature and synonymy, we have confined ourselves in the case of most of the species to a statement of the work in which the species was first described, and of some of the more important works in which it is mentioned. It is only where there is any confusion regarding the nomenclature, that we have given a fuller list of synonyms in order precisely to define our view.

During the Norwegian North Atlantic Expedition, there were found

Brachiopoda . . .	8 species		
Pelecypoda . . .	108 „	, with 9	varieties.
Scaphopoda . . .	8 „		
Placophora . . .	10 „		
Gastropoda . . .	192 „	, „ 31	„
Nudibranchiata .	22 „		
Pteropoda . . .	5 „		
Cephalopoda . . .	7 „		

Before discussing more fully the species found during the expedition, we will mention some stations that are of special interest, partly on account of their wealth of species, partly because of the occurrence of animal remains at unusual depths.

As early as 1844, at the meeting of Scandinavian naturalists in Christiania. Professor Rasch drew attention to the abundant animal life on the fishing banks off Aalesund. Subsequently Professor G. O. Sars in his „Bidrag til Kundskaben om Dyrelivet paa vore Havbanker“<sup>1)</sup>, gave a fuller account of the animal forms frequenting the banks off Aalesund and Christiansund.

The North Atlantic Expedition succeeded in proving the existence of a similar, and still more abundant, animal life on the banks along the coast of northern Norway. The richest localities were Station 195 (107 fathoms), on the bank to the north of Senjen, and Stations 173 b (300 fathoms) and 192 (649 fathoms), west of Senjen, both on the slope of the bank, towards deep water.

Arter (Species).	Stat.		
	195, 107 fv.	173 b, 300 fv.	192, 649 fv.
<i>Pecten imbrifer</i> , Low. . . . .			†
„ <i>tigrinus</i> , Müll. . . . .		†	
„ <i>vitreus</i> , Chemn. . . . .			†
<i>Portlandia tenuis</i> , Phil. . . . .	†		†
„ <i>frigida</i> , Torell . . . . .			†
<i>Nucula delphinodonta</i> , Migh. & Ad. .			†
<i>Arca nodulosa</i> , Müll. . . . .		†	

<sup>1)</sup> Christiania Vid. Selsk. Forhandl. 1872, p. 73.

Arter (Species).	Stat. 195, 107 fv.	Stat. 173 b, 300 fv.	Stat. 192, 649 fv.
<i>Arca pectunculoides</i> , var. <i>septentrionalis</i>		†	†
<i>Limopsis minuta</i> , Phil. . . . .	†	†	†
<i>Modiola phaseolina</i> , Phil. . . . .		†	†
<i>Dacrydium vitreum</i> , Holb. . . . .	†	†	†
<i>Astarte acuticostata</i> , Jeffr. . . . .			†
„ <i>sulcata</i> , da Costa . . . . .		†	
<i>Montacuta substriata</i> , Mont. . . . .			†
<i>Kelliella miliaris</i> , Phil. . . . .			†
<i>Kellia suborbicularis</i> , Mont. . . . .			†
<i>Lasaea pumila</i> , S. Wood . . . . .			†
<i>Axinus flexuosus</i> , Mont. . . . .			†
„ <i>emyrinus</i> , M. Sars . . . . .			†
„ <i>ferruginosus</i> , Forbes . . . . .			†
<i>Venus ovata</i> , Pen. . . . .		†	
<i>Asbjørnsenia striata</i> , Friele . . . . .		†	
<i>Macra gallina</i> , da Costa . . . . .		†	
<i>Neæra arctica</i> , M. Sars . . . . .			†
„ <i>lumellosa</i> , M. Sars . . . . .			
<i>Poromya granulata</i> , Nyst & West. . . . .			†
<i>Lyonsiella abyssicola</i> , M. Sars . . . . .			†
<i>Mya truncata</i> , Lin. . . . .	†		
<i>Dentalium entale</i> , Lin. . . . .		†	
„ <i>occidentale</i> , Stimps. . . . .	†		
<i>Cadulus subfusiformis</i> , M. Sars . . . . .	†		
<i>Acmaea rubella</i> , Fabr. . . . .		†	
<i>Pilidium fulvum</i> , Müll. . . . .	†	†	†
<i>Puncturella noachina</i> , Lin. . . . .	†	†	†
<i>Molleria costulata</i> , Moll. . . . .		†	
<i>Cyclostrema basistriatum</i> , Brug. . . . .		†	
„ <i>rugulosum</i> , Jeff. . . . .		†	
„ <i>laevigatum</i> , Jeff. . . . .		†	
„ <i>petterseni</i> , Friele . . . . .	†	†	†
„ <i>areolatum</i> , G. O. Sars . . . . .		†	†
„ <i>millipunctatum</i> , Friele . . . . .			†
„ <i>willei</i> , Friele . . . . .		†	†
„ <i>profundum</i> , Friele. . . . .			†
<i>Margarita cinerea</i> , Couth. . . . .		†	
<i>Macheroplax laevis</i> , Friele . . . . .		†	
„ <i>obscura</i> , Couth. . . . .			†
<i>Pilidium radiatum</i> , M. Sars . . . . .			†
<i>Capulus hungaricus</i> , Lin. . . . .	†	†	†
<i>Velutina laevigata</i> , Pen. . . . .			†
„ <i>zonata</i> , Gould . . . . .			†
<i>Lamellaria latens</i> , Müll. . . . .		†	
<i>Marsenina micromphala</i> , Bergh . . . . .			†
<i>Ampullina smithii</i> , Brown . . . . .	†		
<i>Amauropsis islandicus</i> , Gmel. . . . .		†	
<i>Natica affinis</i> , Gmel. . . . .		†	†
<i>Trichotropis borealis</i> , Brod. & Sow. . . . .		†	
„ <i>conica</i> , Moll. . . . .	†	†	
<i>Rissoa membranacea</i> , Adams . . . . .		†	
„ <i>verrilli</i> , Friele . . . . .			†

Arter (Species).	Stat. 195, 107 fv.	Stat. 173 b, 300 fv.	Stat. 192, 649 fv.
<i>Rissoa cimicoides</i> , Forbes . . . . .	†	†	
„ <i>syngenes</i> , Verr. . . . .			†
„ <i>jeffreysi</i> , Waller . . . . .	†	†	†
„ <i>subsoluta</i> , Arad. . . . .	†		†
„ <i>punctura</i> , Mont. . . . .	†	†	
„ <i>atlantica</i> , Mont. . . . .		†	
„ <i>striata</i> , Adams . . . . .		†	†
„ <i>turgida</i> , Jeff. . . . .			†
<i>Cerithium procerum</i> , Jeff. . . . .			†
<i>Lorenella metula</i> , Lov. . . . .	†	†	†
<i>Cerithiopsis costulata</i> , Moll. . . . .	†	†	†
<i>Laocochlis granosa</i> , Wood . . . . .	†		
<i>Adis walleri</i> , Jeff. . . . .	†	†	
„ <i>exigua</i> , G. O. Sars . . . . .	†	†	
<i>Hemiacis ventrosa</i> , Jeff. . . . .			†
„ <i>glabra</i> , G. O. Sars . . . . .	†	†	†
<i>Parthenia spiralis</i> , Mont. . . . .	†		
<i>Odostomia unidentata</i> , Mont. . . . .	†	†	
„ <i>acuta</i> , Jeff. . . . .	†	†	
„ <i>sublustris</i> , Friele . . . . .			†
<i>Eulimella scille</i> , Scacchi . . . . .	†		
„ <i>ventricosa</i> , Forbes . . . . .	†		
<i>Eulina incurva</i> , Ren. . . . .		†	†
„ <i>bilineata</i> , Ald. . . . .	†	†	†
„ <i>lauræ</i> , Friele . . . . .			†
<i>Adeorbis fragilis</i> , G. O. Sars . . . . .	†		†
<i>Admete viridula</i> , Fabr. . . . .			†
„ <i>contabulata</i> , Friele . . . . .			†
„ <i>inflata</i> , Friele . . . . .			†
<i>Clathurella linearis</i> , Mont. . . . .		†	
<i>Mangilia anceps</i> , Eich. . . . .		†	†
„ <i>anona</i> , G. O. Sars . . . . .	†		†
„ <i>nana</i> , Lov. . . . .		†	†
„ <i>puckardi</i> , Verr. . . . .			†
<i>Bela scalaris</i> , var. <i>abyssicola</i> , Friele . . . . .			†
„ <i>cancellata</i> var. <i>declivis</i> . . . . .			†
„ <i>tenuiscostata</i> , M. Sars & var. <i>willei</i> , Friele . . . . .	†		†
„ <i>bicarinata</i> , Couth. . . . .		†	†
„ <i>koreni</i> , Friele . . . . .			†
<i>Typhlomangilia nivalis</i> , Lov. . . . .	†		
<i>Spirotropis carinata</i> , Phil. . . . .		†	
<i>Volumitra grønlantica</i> , Beck . . . . .		†	
<i>Metzgeria alba</i> , Jeff. . . . .	†		
<i>Trophon clathratus</i> , Lin. . . . .		†	
„ <i>barvicensis</i> , Johnst. . . . .		†	
<i>Asturis rosacea</i> , Gould . . . . .		†	
<i>Anachis haliacti</i> , Jeff. . . . .		†	†
<i>Buccinum grønlanticum</i> , var. <i>sericata</i> . . . . .			†
„ <i>humphreysianum</i> , Benn. . . . .	†		
„ <i>hydrophanum</i> , Hanc. . . . .			†
„ <i>sulcatum</i> , Friele . . . . .			†

Arter (Species).	Stat.	Stat.	Stat.
	195, 107 fv.	173 b, 300 fv.	192, 649 fv.
<i>Neptunea islandica</i> , Chemn. . . . .			†
.. <i>turgidula</i> , Jeli. . . . .			†
.. <i>latericea</i> , Möll. & var. <i>lævior</i> . .			†
.. <i>tasiformis</i> , Brod. . . . .	†		
.. <i>turrita</i> , M. Sars . . . . .			†
.. <i>lachesis</i> , Mørch . . . . .			†
<i>Cylichna alba</i> , Brown . . . . .		†	
.. <i>discus</i> , Watson . . . . .			†

Naar man mindes, at hver station kun er et eneste skrabekast, maa station 192 med sine 85 arter, hvoraf 18 arter er ny for Norges fauna og 10 arter ny for viden-skaben, siges at være en ganske mærkelig lokalitet. Sta-tion 173 b er ligeledes meget rig (59 arter). Derimod har station 195 en forholdsvis fattig fauna om end ogsaa denne station havde et rigt dyreliv (43 arter). Dette bekræfter forøvrigt, hvad professor Sars i ovennævnte arbeide om dyrelivet paa vore havbanker udtaler, at det særlig er af-heldet ud mod det store havdyb, som viser et paafaldende rigt dyreliv.

En stor del af de paa station 173 b og station 192 fundne mollusker var døde skaller og ganske paafaldende er det at se, hvor mange skaller af grundtvandsformer, der havde samlet sig paa disse forholdsvis store dyb. Bund-prøven fra station 192 bestaar „væsentlig af uorganiske dyrelevninger, sammenkittede ved brunt ler“ (Schmelck)<sup>1)</sup>. Bunden er med andre ord en skjælbanke. Ikke saa faa skalrester har ogsaa et semifossilt udseende. Det er derfor ikke saa usandsynligt, at vi her har for os glaciale aflei-ninger. Efter vor formening foregaar der dog fremdeles en stor udskylling af døde skaller fra den ovenliggende, grundere del af banken.

Station 173 b, der havde bjerggrund, gav indtryk af at være en mere recent skjælbanke.

Paa vedføiede kartskitse har vi angivet disse 3 sta-tioner.

<sup>1)</sup> Nordhavs-Exp., Kemi, 1882, p. 20.

Arter (Species).	Stat.	Stat.	Stat.
	195, 107 fv.	173 b, 300 fv.	192, 649 fv.
<i>Amphisphyræ hyalina</i> , Tart. . . . .		†	
.. <i>hiemalis</i> , Couth. . . . .		†	†
<i>Scaphander puncto-striatus</i> , Migh. . .			†
<i>Philine finmarchica</i> , M. Sars . . . .			†
.. <i>quadrata</i> , Wood . . . . .	†		†
<i>Limacina balea</i> , Möll. . . . .			†
<i>Cleodora quadrata</i> , Lin. . . . .			†
<i>Cavolinia trispinosa</i> , Les. . . . .			†

When we recollect that each station is only a single cast of the drag-net, it must be said that Station 192, with its 85 species, of which 18 are new to the Norwegian fauna, and 10 new to science, is quite a remarkably rich locality. Station 173 b is also very rich (59 species). Station 195, on the other hand, has a comparatively poor fauna, although it possessed an abundance of animal life (43 species). This moreover confirms Professor Sars's state-ment in his above-mentioned work on the animal life on the Norwegian ocean banks, that it is especially the slope towards the great depths that shows a strikingly abundant animal life.

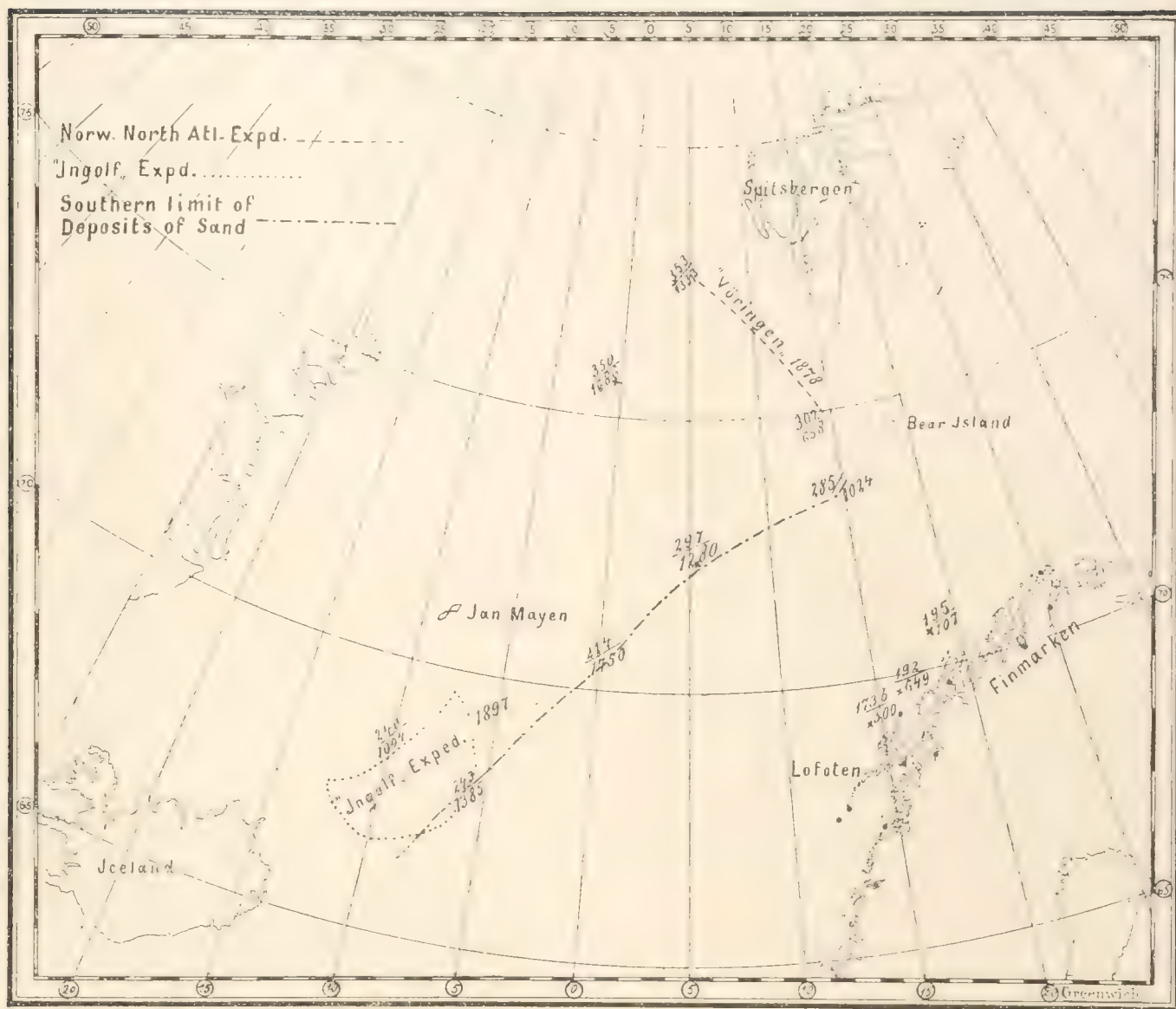
A large portion of the molluscs found at Stations 173 b and 192 were empty shells, and it is quite remarkable how many shells of shallow-water forms had collected in these comparatively great depths. The bottom-sample from Station 192 consists 'mainly of inorganic animal remains, cemented together with brown clay' (Schmelck)<sup>1)</sup>. In other words, the bottom is a shell-bank. Not a few of the shell-fragments have also a half-fossilised appearance. It is therefore not improbable that we have here glacial dé-posits. It is our opinion, however, that a great washing out of empty shells from the upper, shallower part of the bank, is still in progress.

Station 173 b, which had a rocky bottom, gave the impression of being a more recent shell-bank.

On the accompanying sketch-map we have indicated these three stations.

<sup>1)</sup> North Atlantic Expedition; Chemistry, p. 20. 1882.





I „Catalog der auf der norwegischen Nordmeerexpedition bei Spitzbergen gefundenen Mollusken“<sup>1)</sup> henleder Friele opmærksomheden paa, at der i Ishavet søndenfor Spitzbergen findes døde skaller af grundtvandsmollusker spredt over de store dyb og senere har den danske Ingolf-expedition paatruffet det samme fænomen i havdybet mellem Jan Mayen og Island. Friele har villet forklare dette fænomen ved en istransport, idet skalresterne af isen er ført ud paa dybet. Dr. A. S. Jensen, Kjøbenhavn, mener derimod i sin afhandling „Om levninger af Grundtvandsdyr paa store Havdyb mellem Jan Mayen og Island“<sup>2)</sup>, at „der i kvartærperioden maa have fundet en sænkning sted, hvis maximum ikke kan anslaaes til ringere en henved 8000 fod (ca. 2500 meter)“. De grundtvandsdyrlevninger man der finder skulde altsaa være fossile rester, som er igjenliggende paa sit oprindelige hjemsted.

Da disse fund har faaet en større betydning ved at de muligens kan give oplysning om geologiske forhold, hid-

In the 'Catalog der auf der norwegischen Nordmeer expedition bei Spitzbergen gefundenen Mollusken'<sup>1)</sup>, Friele draws attention to the fact that in the Arctic Ocean south of Spitzbergen, empty shells of shallow-water molluscs are found scattered over the great depths, and the Ingolf Expedition subsequently met with the same phenomenon in the ocean depth between Jan Mayen and Iceland. Friele has attempted to explain this phenomenon by the agency of ice, the shell-fragments being carried out into deep water by the ice. Dr. A. S. Jensen, Copenhagen, on the other hand, in his treatise „Om Levninger af Grundtvandsdyr paa store Havdyb mellem Jan Mayen og Island“<sup>2)</sup>, thinks that 'in the Quaternary a subsidence must have taken place, of which the maximum cannot be put at less than about 8000 feet (about 2500 metres)'. The remains of shallow-water animals found there, would thus be fossil remains, left lying in their original habitat.

As these finds have acquired greater importance from their possible ability to afford information respecting geo-

<sup>1)</sup> Jahrb. Deutsch. Mal. Gesellsch., vol. 6, 1879, p. 264.

<sup>2)</sup> Vidensk. Meddel., 1900, p. 229.

<sup>1)</sup> Jahrb. Deutsch. Mal. Gesellsch., vol. 6, 1879, p. 264.

<sup>2)</sup> Vidensk. Meddel., 1900, p. 229.

sætter vi her en fortegnelse over de skalrester af grundtvandsmollusker, som af Nordhavsexpeditionen fandtes strøet ud over havdybet. Skalresterne toges paa station 312, 74° 54' N. Br., 14° 53' Ø. Lg., 658 fv., og stat. 353, 77° 58' N. Br., 5° 10' Ø. Lg., 1333 fv.

*Pecten islandicus*, Müll. Station 312. Flere rudimenter og et vel bevaret ungt exemplar.

*Yoldia arctica*, Gray. Station 312. Tre ulige velbevarede skaller. Station 353. kun et rudiment.

*Yoldia intermedia*, M. Sars. Station 312. Et større og et mindre vel bevaret skal.

*Astarte borealis*, Chemn. Station 312. Tre umage skaller med vel bevaret epidermis.

*Serripes grønlandicus*, Chemn. Station 312. To sammenhørende skaller med ganske vel bevaret epidermis og et enkelt eroderet skal. Station 353. Friske fragmenter.

*Venus fluctuosa*, Gould. Station 312. Et skal med vel bevaret epidermis. Station 353. To, noget angrebne skaller.

*Lyonsia arenosa*, Møll. Station 353. Et frisk rudiment.

*Mya truncata*, Lin. Station 312 og 353. Rudimenter.

*Saxicava arctica*, Lin. Station 312. Et stærkt slidt større skal og et mindre exemplar med begge skaller *in situ* og hængselligamentet vel bevaret.

*Margarita helicina*, Phipps. Station 312. Rudiment.

*Lacuna crassior*, Mont. Station 353. Et noget lederet exemplar. Da det var friskt, var epidermis vel bevaret.

*Trophon clathratus*, Lin. Station 312. Et stort, noget slidt exemplar.

Paa medfølgende kartskitse har vi angivet de to stationer, hvor ovennævnte skalrester af grundtvandsmollusker toges. Samtidig har vi indtegnet det havstykke, hvor Ingolfexpeditionen fandt sine skallelevninger.

I Frieles dagbog fra expeditionen anfører han, at paa station 353 bestod „bunden af binoculinler med talrige, tildels store stene. Trawlbommen kom brækket op“. Der anvendtes i 1878 væsentlig beamtrawlskrabninger. Paa en noget vestligere station, station 350, 1686 fv., omtrent midt mellem Spitsbergen og Grønland, tabtes trawlen. Efter erfaringerne fra station 353 er der grund til at antage, at det er store stene, som har tynget saa stærkt i trawlen, at tauget brækkede. Vi anfører dette for at henvende opmærksomheden paa, at der i de store dyb i Grønlandshavet ligger udkastet mange og store stene.

Det trawl-net, som benyttedes af expeditionen har neppe kunnet trænge mere end nogle faa centimeter ned i

logical conditions, we give here a list of the shell-remains of shallow-water molluscs that were found by the North Atlantic Expedition, scattered over the arctic ocean depths. The shell-remains were found at Station 312, in 74° 54' N. Lat., 14° 53' E. Long., at a depth of 658 fathoms, and at Station 353, in 77° 58' N. Lat., 5° 10' E. Long., at 1333 fathoms.

*Pecten islandicus*, Müll. Station 312, several rudiments and a well-preserved young specimen.

*Yoldia arctica*, Gray. Station 312, three not equally well preserved valves; Station 353, only a rudiment.

*Yoldia intermedia*, M. Sars. Station 312, one large and one small, well-preserved valve.

*Astarte borealis*, Chemn. Station 312, three valves with well-preserved epidermis.

*Serripes grønlandicus*, Chemn. Station 312, two matching valves with well-preserved epidermis, and a single eroded valve; Station 353, fresh fragments.

*Venus fluctuosa*, Gould. Station 312, a valve with well-preserved epidermis; Station 353, two valves somewhat injured.

*Lyonsia arenosa*, Møll. Station 353, a fresh rudiment.

*Mya truncata*, Lin. Stations 312 & 353, rudiments.

*Saxicava arctica*, Lin. Station 312, a much worn, large valve, and a smaller specimen with both valves *in situ*, and the hinge-ligament in a well preserved state.

*Margarita helicina*, Phipps. Station 312, a rudiment.

*Lacuna crassior*, Mont. Station 353, a somewhat injured specimen. When taken out of the dredge, the epidermis was in a good state of preservation.

*Trophon clathratus*, Lin. Station 312, a large, somewhat worn specimen.

On the accompanying sketch-map, we have marked the two stations at which the above shell-remains of shallow-water molluscs were found. We have also drawn in the section of ocean in which the Ingolf Expedition found their shell-remains.

Friele, in his diary from the expedition, has an entry to the effect that at Station 353, the bottom 'consisted of Binoculina Clay containing numerous, partly large, stones. The trawl beam came up broken'. In 1878, chiefly beam-trawl dredgings were made. At a somewhat more westerly station, Station 350 (1686 fathoms), about midway between Spitsbergen and Greenland, the trawl was lost. From the experience of Station 353, there is reason to suppose that large stones have weighed so heavily in the trawl, that the rope broke. We report this in order to draw attention to the fact that in the great depths of the Greenland Sea, there are many large stones lying scattered about.

The trawl-net employed by the expedition was hardly able to force its way more than a few centimetres into



det løse slam<sup>1)</sup>. Vi skulde derfor antage, at det kun er det øverste bundlag, som er bleven afflodt.

Dr. Jensen antager, at sedimentærdannelsen paa de store havdyb foregaar overmaade langsomt, idet han støtter sig til John Murrays iagttagelser fra Challengerexpeditionen. De arktiske have frembyder imidlertid ikke de samme fysikalske forhold som de store verdenshave. Enhver, der har bereist de arktiske egne, vil have seet, at isen fører adskillig slam med sig. Paa Nordhavsexpeditionen saaes oftere mere eller mindre skidden is og de samme iagttagelser gjorde Nansen i Danmarksstrædet.

Konservator Kolthoff fortæller i „Ur Djurens Liv“ (vol. 2, p. 457), at tre klapmyds (*Cystophora cristata*), som blev skudt paa en plads, hvor havet var mellem 2 og 3 tusen meter dybt, havde lerslam i maven. To af dem havde maven fuld deraf. Dette slam maa dyrene have slikket i sig ude paa drivisen, thi det er utænkeligt, at de kunde dykke ned til bunden paa et saadant dyb; Heller ikke er det tænkeligt, at de kan have faaet det<sup>1</sup> sig inde ved land, da dette var for langt fjernet og denne særligt desuden holder til ude paa drivisen mellem Spitsbergen, Jan Mayen og Grønland og kun sjelden træffes den under land eller i fjordene.

Tager vi for os Schmelecks arbejde over havbundens afleiringer<sup>2)</sup>, vil vi finde, at der var sand og småsten i bundprøverne fra en hel del dybvandsstationer fra Spitsbergen nedover mod Island og paa vedføjede kart har vi afsat sydgrænsen for disse stationer. Som det vil sees falder den paa en paafaldende maade sammen med grænsen for isens smeltebælte. I bundprøverne fra stationerne nord for denne linie var der sand og grus, syd for linien fandtes derimod kun lerslam. Først fra stationerne ind under kystbankerne gjenfinder vi igjen grus og sand. Af disse stationer med sand i bundprøverne ligger station 240 og 243 indenfor Ingolfexpeditionens undersøgelsesfelt.

En ganske interessant bekræftelse paa det rige materiale, som isen maa sprede over sit smeltefelt, fik vi ved at faa anledning til at se en planktonprøve som kandidat Wollebæk havde taget under et togt med „Heimdal“ vaaren 1900 i nærheden af iskanten paa 70° 24' N. Br., 42° 29' Ø. Lg. Dybde 50 fv. Planktonprøven toges midtvands paa 25 fv. I denne fandtes en paafaldende mængde sandkorn samt ikke saa faa små skalrester. Alt dette synes paa det bestemtteste at vise, at sedimentærdannelsen i de

the soft mud<sup>1</sup>. We should therefore suppose that it is only the uppermost layer of the bottom that has been skimmed.

Dr. Jensen assumes that the formation of sediment in the great ocean depths takes place exceedingly slowly, supporting his assumption on John Murray's observations on the Challenger Expedition. The arctic seas, however, do not present the same physical conditions as the large oceans. Every one who has travelled in the arctic regions will have seen that the ice carries a considerable quantity of mud with it. Ice that was more or less dirty was frequently seen on the North Atlantic Expedition, and Nansen observed the same thing in Denmark Strait.

Curator Kolthoff, in his 'Ur Djurens Liv' (vol. II, p. 457) relates that three hooded seals (*Cystophora cristata*) that were shot in a place where the sea was between two and three thousand metres deep, had clayey mud in their stomach, two of them being quite filled with it. The animals must have licked up this mud out on the drift-ice, for it is impossible to imagine that they could dive down to the bottom at such a depth. Nor is it likely that they can have swallowed it on shore, as this was too remote; and moreover this species of seal lives out on the drift-ice between Spitsbergen, Jan Mayen, and Greenland, and is rarely found near the shores or in the fjords.

If we look at Schmeleck's report on the „Oceanic Deposits“<sup>2)</sup>, we find that there were sand and small stones in the bottom-samples from a number of deep-water stations, from Spitsbergen southwards towards Iceland. In the accompanying map, we have marked the southern limit of these stations. It will be seen that this coincides in a remarkable manner with the limit for the melting of the ice. In the bottom-samples from the stations north and west of this line, there was sand and gravel; south and east of it, on the other hand, there was only clayey mud. It is only at the stations in under the coast-banks that we once more find gravel and sand. Among the stations with sand in their bottom-samples, Stations 240 & 243 are within the field of the investigations of the Ingolf Expedition.

We had a most interesting proof of the abundance of matter that the ice must scatter over its melting area, in seeing a plankton-sample taken by Hr. Wollebæk during a cruise with the 'Heimdal' in the spring of 1900, near the edge of the drift-ice in 70° 24' N. Lat. and 42° 29' E. Long., depth 50 fathoms. The plankton-sample was taken in midwater at 25 fathoms. A remarkable number of sand particles were found in this sample, and not a few small fragments of shell. All this goes most

<sup>1)</sup> Jensen antager at trawlen kan trænge indtil 2 fod (62 cm.) ned i bunden. Saa svagt, trawl nettet paa Nordhavsexpeditionen var belastet, holder vi dette for usandsynlig.

<sup>2)</sup> Nordhavs Exp., Kemi.

<sup>1)</sup> Jensen assumes that the trawl can penetrate as much as 2 feet (62 cm.) into the bottom. So lightly was the trawl-net on the North Atlantic Expedition loaded, that we consider this improbable.

<sup>2)</sup> North Atlantic Expedition, Chemistry.



arktiske have ikke kan foregaa saa langsomt som af Jensen formodet.

Flere af de skalrester, som fandtes paa disse store dyb, giver for en del indtryk af at have været udsat for gnidning. De maa saaledes enten være stranslidte eller have faaet afslibningen ved friktion under isens bevægelser.

For de fleste skalresters vedkommende, som toges paa det største dyb, 1333 fv., var kalken i mere eller mindre opløst tilstand, saaat adskillige skaller endog ikke kunde opbevares<sup>1)</sup>. Dette, at skallerne saa hurtig synes at opløses paa disse store dyb, tyder paa, at de har været under en kemisk paavirkning, og at de saaledes maa have ligget paa havbundens overflade og ikke været dækket af et beskyttende lerlag. At de derfor i nogen længere tid — geologisk talt — skulde have ligget paa bunden, forekommer os lidet sandsynlig.

Vi tør ikke indlade os i en diskussion, hvorvidt der har fundet en sænkning sted af de arktiske have. Men vi tror ikke, at grundtvandsskallernes forekomst paa de store dyb i Grønlandshavet kan benyttes som et bevis for hypotesen. Den strækning, hvor disse skaller er fundne, ligger inden smeltebeltet for store ismasser og naar disse fører med sig større og mindre mængder slam, som sikkerlig skriver sig fra kysterne, ligger det nær at antage, at ogsaa skallerne er ført ud paa dybet ved isen.

For at faa en tilfredsstillende forklaring paa et fænomen, som muligens kan faa en større geologisk betydning, vilde det være af interesse, at geologerne nærmere undersøgte de løse stene, som findes paa den havstrækning, hvorom der er tale. Muligens vilde en saadan undersøgelse give oplysning om, hvorfra de stammer. Undersøgelser af dette slags har tidligere løst interessante geologiske problemer.

<sup>1)</sup> Cfr. John Murray & R. Irvine: On Coral Reefs and other Carbonate of Lime Formations in Modern Seas; Proc. Roy. Soc. Edinburgh, vol. 17, p. 98.

decidedly to prove that the formation of sediment in the arctic seas cannot take place as slowly as Jensen supposes.

Several of the fragments of shell found at these great depths give a certain impression of having been subjected to friction. They must thus either have been ground upon the shore, or have acquired this worn appearance by friction during the moving of the ice.

In most of the shell-remains taken at the greatest depth, 1333 fathoms, the lime was in a more or less decomposed condition, so that several shells could not even be preserved<sup>1)</sup>. The fact of the shells being apparently so rapidly decomposed at these great depths, indicates that they have been under chemical influence, and must thus have lain upon the surface of the bottom, and cannot have been covered with a protecting layer of clay. It seems, therefore, scarcely probable that they have lain there for any length of time, geologically speaking.

We will not venture on any discussion as to whether a subsidence of the arctic seas has taken place, but we do not believe that the occurrence of shell-remains from shallow-water in the great depths of the Greenland sea can be used as an argument for this hypothesis. The region in which these shells are found, lies within the melting-zone of great masses of ice, and as these take with them more or less mud that certainly originates on the coasts, it is not unreasonable to suppose that the shells are also carried out into deep water by the ice.

It would be interesting, if, in order to obtain a satisfactory explanation of a phenomenon which may possibly be of great geological importance, geologists would examine the loose stones that are found in this part of the ocean. An examination such as this might possibly give some enlightenment as to whence they come. Examinations of this kind have solved interesting geological problems before now.

<sup>1)</sup> Cfr. John Murray & R. Irvine: On Coral Reefs and other Carbonate of Lime Formations in Modern Seas; Proc. Roy. Soc. Edinburgh, vol. 17, p. 98.

# Brachiopoda.

## *Rhynchonella psittacea*, Chemnitz.

- Anomia rostrum psittacea*, Chemnitz, Conch. Cab. vol. 8, 1785, p. 106, Pl. 78, fig. 713.  
*Hypothyris* — Forbes & Hanley, Brit. Moll. vol. 2, 1853, p. 346, Pl. 57, figs. 1—3.  
*Rhynchonella* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 9, Pl. 1, fig. 1.  
 — — Davidson, Mon. Recent Brach., part 2, 1887, p. 163.

**Findested.** Alten, 20 fv., og stationerne 267, 280 og 336.

Ved de norske kyster er *rhynchonella psittacea* kun kjendt fra Tromsø og Finmarken. Davidson anfører ogsaa Trondhjemsfjorden, hvad der maa skrive sig fra en feilskrift hos Jeffreys, som denne forøvrigt senere har rettet. Denne brachiopode er en circumpolar art, som er kjendt fra Europas nordkyst, hvor den har sin sydgrænse ved Færøerne. Fra Shetlandsoerne har Jeffreys to fuldstændige men døde skaller. Arten er derfor der antagelig subfossil. Det samme gjælder om dens forekomst i Nordsoen (Metzger). Den er endvidere kjendt fra Karahavet, Novaja Semlja, Franz Josefs Land, Jan Mayen, Grønland, hvor den er funden helt op til Franklin Pierce Bay (79° 25' N. Br.), Nordamerikas nord- og østkyst indtil Maine, Japan og Beringstrædet. Den bathymetriske udbredelse er 5—690 fv. Fossil er den funden i de yngre glaciæle lag ved Christiansund samt i de posttertiære i England, Canada og Sibirien, nordlige Rusland og Spitsbergen.

**Locality.** Alten (20 fathoms), and Stations 267, 280 and 336.

*Rhynchonella psittacea* is known on the Norwegian coasts only off Tromsø and Finmark. Davidson also mentions the Trondhjem Fjord, which must be due to a mistake of Jeffreys, since corrected by him. This brachiopod is a circumpolar species, known off the northern shores of Europe, where it has its southern limit at the Faroe Isles. Jeffreys has two perfect, but empty valves from the Shetlands. The species is therefore presumably sub-fossil there. The same is the case with its occurrence in the North Sea (Metzger). It has moreover been found in the Kara Sea, Novaja Semlja, Franz Josef Land, Spitsbergen, Jan Mayen, Greenland — where it has been found right up to Franklin Pierce Bay (79° 25' N. Lat.) — the north coast of North America and east coast as far as Maine, Japan and the Bering Straits. Its bathymetrical distribution is from 5 to 690 fathoms. It is found in a fossil state in the post-glacial strata at Christiansund, and in the post-tertiary in England, Canada, Siberia, northern Russia and Spitsbergen.

## *Neatretia gnomon*, Jeffreys.

- Cryptopora gnomon*, Jeffreys, Nature, vol. 1, 1869, p. 136.  
*Atretia* — Jeffreys, Proc. Roy. Soc., vol. 18, 1869, p. 421.  
 — — Davidson, Mon. Recent Brach., part. 2, 1887, p. 173, Pl. 25, figs. 6—13.  
*Neatretia* — Fischer & Oehlert, Exp. Sci Travailleux & Talisman, 1891, p. 122.

Denne ægte dybvandsbrachiopode toges kun paa stat. 175, 415 fv. og stat. 192, 649 fv. Paa sidstnævnte lokalitet forekom den ganske talrig.

This true deep-water brachiopod was only taken at Station 175 (415 fathoms), and Station 192 (649 fathoms). In the last-named locality, it occurred in large numbers.

*Neatretia gnomon* er tidligere kjendt fra Davisstrædet og den nordlige del af Atlanterhavet fra havet udenfor Tromsø og Labrador til Maroco, Azorerne og Floridastrædet. Den bathymetriske udbredelse er 415—1750 fv.

*Neatretia gnomon* has been previously known to occur in the Davis Strait and from the north part of the Atlantic Ocean, off Tromsø and Labrador, to Morocco, the Azores, and Florida Channel. Its bathymetrical distribution is from 415 to 1750 fathoms.

### *Terebratulina caput serpentis*, Linné.

<i>Anomia</i>	<i>caput serpentis</i> , Linné, Syst. Nat., ed. 13, 1767, p. 1153.
<i>Terebratula</i>	— — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 353, Pl. 56, figs. 1—4.
—	— — Jeffreys, Brit. Conch., vol. 2, 1863, p. 14, Pl. 19, fig. 2.
<i>Terebratulina</i>	- — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 9, Pl. 1, fig. 5.
-	- — Davidson, Mon. Recent Brach., part. 1, 1886, p. 17, Pl. 3, fig. 12, Pl. 4, figs. 1—11.

*Terebratulina caput serpentis* foreligger kun fra Husø, 40 fv. og stat. 79, 155 fv.

Denne brachiopode er almindelig langs vor kyst indtil Hammerfest. Forøvrigt er den kjendt fra Murmankysten, Hvidehavet, Vesteuropa, Middelhavet, Afrikas vestkyst indtil Cap Vert. Jamaicas nordostlige kyst, Korea og Japan. Den har ogsaa været anført fra de arktiske farvande, saasom Spitsbergen, men foreligger her antagelig en forveksling med den nærstaaende *terebratulina septentrionalis*. Ved Grønland forekommer dog begge former, *terebratulina caput serpentis* er imidlertid sjeldnere end den anden. Ved Nordamerikas østkyst synes kun *terebratulina septentrionalis* at være repræsenteret. *Terebratulina caput serpentis* har ogsaa været anført fra Australien og New Zealand men synes dens forekomst i de antarktiske farvande at trænge nærmere bekræftelse. Den bathymetriske udbredelse er 0—1180 fv. Fossil er den kjendt fra Skandinavien, nordlige Rusland, England, Belgien, Frankrig, Italien og Azorerne.

*Terebratulina caput serpentis* was only found at Husø (40 fathoms), and Station 79 (155 fathoms).

This brachiopod is common along the Norwegian coast up to Hammerfest. It is also found off the Murman coast, in the White Sea, Western Europe, the Mediterranean, off the west coast of Africa down to Cape Verd, the north-east coast of Jamaica, in the Corea and Japan. It has also been reported in Arctic waters, e. g. Spitsbergen; but here it has probably been confounded with the nearly-allied *Terebratulina septentrionalis*. Both forms, however, occur off Greenland, though *Terebratulina caput serpentis* is the more uncommon of the two. Off the east coast of North America, only *T. septentrionalis* appears to be represented. *T. caput serpentis* has been reported in Australia and New Zealand, but its occurrence in antarctic waters seems to require further corroboration. Its bathymetrical distribution is from 0 to 1180 fathoms. It is found as a fossil in Scandinavia, northern Russia, England, Belgium, France, Italy, and the Azores.

### *Terebratulina septentrionalis*, Couthouy.

<i>Terebratulina septentrionalis</i> , Couthouy, Boston Journ. Nat. Hist., vol. 2, 1838, p. 65, Pl. 3, fig. 18.
— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 10, Pl. 1, fig. 4 a—c.
— <i>caput serpentis</i> , var. <i>septentrionalis</i> , Davidson, Rep. on Brach., Voy. Challenger, Zool. vol. 1, 1880, p. 33, Pl. 1, figs. 3—9.
— <i>septentrionalis</i> , Davidson, Mon. Recent Brach., part 1, 1886, p. 28, Pl. 5, figs. 1—31 & 43—52.
— — Fischer & Oehlert, Res. Camp. Sci. du Prince de Monaco, Fasc. 3, 1892, p. 9, Pl. 1, fig. 1 a—t, Pl. 2, fig. 1 u—v.

**Findested.** Stationerne 173 b (døde skaller), 195 (døde skaller) 225, 255 (Vestfjorden), 260 (Porsangerfjorden), 262, 273, 290 og 323, Dybde 107—341 fv.

I overensstemmelse med Davidson og Fischer & Oehlert har vi her opført denne form som en selvstændig art. Det er dog et stort spørgsmaal, om den ikke rettere bør betragtes som en varietet af foregaaende. Denne art har i en end høiere grad end *terebratulina caput serpentis* en kosmopolitisk udbredelse, idet den er funden saavel i arktiske som antarktiske farvande. Hos os var den tidligere kun kjendt fra Finnmarken. Den bathymetriske udbredelse er 10—670 fv.

**Locality.** Stations 173 b (empty valves), 195 (empty valves), 225, 255 (West Fjord), 260 (Porsanger Fjord), 262, 290, and 323. Depth 107—341 fathoms.

In accordance with Davidson, and Fischer & Oehlert, we have here recorded this form as a distinct species. It is a question, however, whether it ought not rather to be regarded as a variety of the preceding form. This species is even more cosmopolitan in its distribution than *T. caput serpentis*, being found in both arctic and antarctic waters. In Norway, it is only found in Finnmark. Its bathymetrical distribution is from 10 to 670 fathoms.



**Liothyris arctica**, Friele.

*Terebratula arctica*, Friele, Nyt. Mag. f. Naturvidensk. vol. 24, 1878, p. 221, fig. 1 a—c.

*Liothyris* — Davidson, Mon. Recent Brach. vol. 1, 1886, p. 10, Pl. 1, figs. 17 & 18.

*Terebratula* — Friele, Nordhavs Exp., Moll. vol. 2, 1886, p. 39, Pl. 12, figs. 17 & 18.

Denne art, som af Jeffreys er henført til *liothyris vitrea* var. *minor* (Proc. Zool. Soc. 1878, p. 404) er ikke alene opretholdt af Davidson, men ogsaa af Fischer & Oehlert i deres monografi over brachiopoder fra „Travailleur“ og „Talisman“ (p. 56).

Af Nordhavsexpeditionen fandtes *liothyris arctica* kun paa en lokalitet ved Jan Mayen, stat. 237, 263 fv. Den er forøvrigt kun kjendt fra Grønlands østkyst og Islands nordvestkyst, 120—160 fv.

This species, which is referred by Jeffreys to *Liothyris vitrea* var. *minor* (Proc. Zool. Soc. 1878, p. 404), is not only maintained by Davidson, but also by Fischer & Oehlert in their monograph on the Brachiopoda from the 'Travailleur' and the 'Talisman' (p. 56).

*Liothyris arctica* was found by the Norwegian North Atlantic Expedition in only one locality off Jan Mayen, Station 237 (263 fathoms). In addition to this, it has only been found off the east coast of Greenland and the north-west coast of Iceland (120—160 fathoms).

**Waldheimia septigera**, Lovén.

*Terebratula septigera*, Lovén, Ind. Moll. Scand., 1846, p. 29.

*Waldheimia septata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 11, Pl. 1, fig. 2.

— *septigera*, Davidson, Mon. Recent Brach., part 1, 1886, p. 56, Pl. 11, figs. 1—10.

Denne art foreligger kun fra en lokalitet, stat. 79, 155 fv.

*Waldheimia septigera* forekommer sparsomt paa de større dyb, ved vor nord- og vestkyst. Ved Østfinmarken er den dog endnu ikke funden. Dens udbredelse synes at være mere sydlig end *Waldheimia cranium*; den mangler nemlig fra de høiarktiske farvande. Den er kjendt fra Vestfinmarken og Færøerne til Cap Bojador (25° 38' N. Br.), Canariske øer og Azorerne. Den kan derfor ikke som af Sars betegnes som en arktisk art. Den bathymetriske udbredelse er 75—725 fv. Fossil er den funden i de postglaciale afleiringer ved Christiansund samt i de tertiære lag i Italien.

This species was found in only one locality, Station 79, at a depth of 155 fathoms.

*Waldheimia septigera* is of sparse occurrence in great depths off the north and west coasts of Norway. It has not yet been found in east Finmark. Its distribution appears to be more southern than that of *W. cranium*, for it is absent from the high arctic waters. It is found from west Finmark and the Faroe Isles to Cape Bojador (25° 38' W. Long), the Canary Isles and the Azores. It cannot therefore be designated, as Sars has designated it, an arctic species. Its bathymetrical distribution is from 75 to 725 fathoms. It is found as a fossil in the post-glacial deposits at Christiansund, and in the tertiary strata in Italy.

**Waldheimia cranium**, O. F. Müller.

*Terebratula cranium*, Prod. Zool. Dan., 1776, p. 249.

— — Jeffreys, Brit. Conch. vol. 2, 1863, p. 11, Pl. 19, fig. 1.

*Waldheimia* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 10, Pl. I, fig. 3 a—b.

— — Davidson, Mon. Recent. Brach., part 1, 1886, p. 61, Pl. 12, figs. 11—23, Pl. 13, figs. 1, 2.

**Findested.** Stationerne 10, 79, 173 b, 192, 195, 255, 261, 262, 290, 323, Husø, Bodø, Hammerfest og Alten 40—60 fv. Dybde, 40—649 fv.

*Waldheimia cranium* er meget almindelig langs hele den norske kyst. Den er en circumpolar art, som er kjendt fra de europæiske kyster, Middelhavet, Afrikas vestkyst indtil Cap Bojador, Spitsbergen, Grønland, Nordamerikas østkyst indtil Rhode Island, Japan og Beringstrædet. Den

**Locality.** Stations 10, 79, 173 b, 192, 195, 255, 261, 262, 290, and 323, Husø, Bodø, Hammerfest, and Alten (40—60 fathoms). Depth 40—649 fathoms.

*Waldheimia cranium* is very common all along the Norwegian coast. It is a circumpolar species which is known off the shores of Europe, in the Mediterranean, off the west coast of Africa down to Cape Bojador, in Spitsbergen and Greenland, off the east coast of North America

bathymetriske udbredelse er 10—1040 fv. Fossil forekommer den i de glaciale og postglaciale afleiringer i Skandinavien. Den er ligeledes funden fossil i Italien.

as far south as Rhode Island, and in Japan and the Bering Straits. Its bathymetrical distribution is from 10 to 1040 fathoms. It occurs in a fossilised state in the glacial and post-glacial deposits in Scandinavia. It is also found as a fossil in Italy.

***Terebratella spitzbergensis*, Davidson.**

*Terebratella spitzbergensis*, Davidson, Proc. Zool. Soc., 1852, p. 78.

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| — | — | Davidson, Ann. & Mag. Nat. Hist. ser. 2, vol. 16, 1855, p. 465, Pl. 10, fig. 3. |
| — | — | Torell, Spitzbergens Molluskfauna, 1859, p. 151. Pl. 1, fig. 1.                 |
| — | — | Jeffreys, Proc. Zool. Soc., 1878, p. 409. Pl. 23, fig. 2.                       |
| — | — | Davidson, Mon. Recent. Brach., part 2, 1887, p. 83, Pl. 16, figs. 1—5.          |

**Findested.** Stationerne 48, 267, 270, 326, 336, 338 og Advent Bay, 40—60 fv. Dybde 40—299 fv.

Denne høiarktiske brachiopode er antagelig circumpolar. Den er kjendt fra Spitsbergen, Barentshavet, Murmankysten, Island, Shetlandsøerne, Grønland, Golfen ved St. Laurence og Japans nordkyst. Den bathymetriske udbredelse er 20—690 fv. Fossil er den funden ved Christiania og Udevalle samt i Kanada og nordlige Rusland.

**Locality.** Stations 48, 267, 270, 326, 336, and 338, and Advent Bay (40—60 fathoms). Depth 40—299 fathoms.

This high-arctic brachiopod is probably circumpolar. It has been found off Spitsbergen in the Barents Sea, off the Murman Coast, Iceland, the Shetland Isles, Greenland, in the Gulf of St. Lawrence, and on the north coast of Japan. Its bathymetrical distribution is from 20 to 690 fathoms. It is found as a fossil at Christiania and Udevalle, and in Canada and northern Russia.

## Pelecypoda.

### *Anomia ephippium*. Linné.

*Anomia ephippium*, Linné, Syst. Nat. ed. 13, 1767. p. 1150.

G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 14.

Den typiske form fandtes ved Husøen; varieteten *squamula* ved stat. 10, 220 fv. og stat. 192, 649 fv. (døde skaller),

*Anomia ephippium* er udbredt fra Murmankysten, Finmarken, Island og Labrador til Brasilien (Pernambuco), Madeira, Cap Vert og Middelhavet. Endvidere er den funden ved Korea, Karolinerne og Tristan de Cunha. Den bathymetriske udbredelse er 0—1450 fv. Fossil er den funden i Skandinavien, nordlige Rusland, Britiske øer, Belgien, Frankrig, Italien, Morea, Rhodes. Østerig og Nordamerika.

The typical form was found at Husø, the variety *squamula* at station 10 (220 fathoms) and Station 192 (649 fathoms; empty valves).

*Anomia ephippium* is distributed from the Murman Coast, Finmark, Iceland and Labrador, to Brazil (Pernambuco), Madeira, Cape Verd and the Mediterranean. It is also found in the Corea, the Caroline Islands and Tristan da Cunha. Its bathymetrical distribution is from 0 to 1450 fathoms. It is found in a fossil state in Scandinavia, northern Russia, the British Isles, Belgium, France, Italy, the Morea, Rhodes, Austria, and North America.

### *Anomia aculeata*, Müller.

*Anomia aculeata*, Müller, Zool. Dan. Prodr., 1776, p. 249.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 15, Pl. 19, fig. 1 a—d.

*Anomia aculeata* fandtes ved stat. 75, 1081 fv. og stat. 290, 191 fv. (døde skaller).

Den er en nordatlantisk art, som er kjendt fra Murmankysten og Finmarken til Middelhavet. Ved Amerikas østkyst har den sin sydgrænse ved Cap Fear. Den bathymetriske udbredelse er 0—1081 fv. Ligesom foregaaende art er den funden fossil over en større del af Europa.

*Anomia aculeata* was found at Station 75 (1081 fathoms) and Station 290 (191 fathoms; empty valves).

It is a North Atlantic species, known from the Murman Coast and Finmark, to the Mediterranean. On the east coast of N. America, its southern limit is Cape Fear. Its bathymetrical distribution is from 0 to 1081 fathoms. Like the preceding species, it is found as a fossil over a great part of Europe.



**Lima excavata**, Fabricius.

*Ostrea excavata*, Fabricius, Schroters Naturg. vol. 2, 1780, p. 117.

*Lima* — Lovén, Ind. Moll. Scand., 1846, p. 72.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 24, Pl. 3, fig. 1 a—d.

Nogle døde skaller og skalfragmenter af denne art fandtes paa stat. 255 (Vestfjorden), 341 fv.

*Lima excavata* er almindelig paa de nederste afsatser mod fjorddybene langs hele den norske kyst. Den er desuden kjendt fra dybet mellem Hebriderne og Færoerne, Portugal, Azorerne og Senegambien. Dens bathymetriske udbredelse er 150—982 fv. Fossil er den funden i Norge og Kalabrien.

Fra Japan omtaler Sowerby en kjæmpemæssig *lima*, *lima goliath*<sup>1)</sup>, som senere er gjenfunden af Challenger expeditionen syd for Japan, 775 fv. og Vest of Sydpatagonien, 245 fv.<sup>2)</sup>. Fra den nordiske *lima excavata* skal den adskille sig ved sit mere buede skal, ved en noget afvigende striering og ved en større og dybere cardinal area. Hos *lima excavata* er imidlertid, selv hos exemplarer fra samme lokalitet, skallets form og dets striering i høj grad varierende. Fra Nordfjord har vi saaledes en række exemplarer, som i saa henseende ikke kan adskilles fra Sowerbys art. Af større betydning synes den cardinal area at være, om end ogsaa denne er meget varierende. Det er derfor et spørgsmaal, om ikke *lima goliath*, Sow. rettest bør betragtes som en kjæmpemæssig varietet af *lima excavata*, Fabr.

Some empty valves and fragments of shell of this species were found at Station 255 (West Fjord), at a depth of 341 fathoms.

*Lima excavata* is common on the deepest coast-ledges of the fjords all along the Norwegian coast. It is also known in the deep water between the Hebrides and the Faroe Isles, in Portugal, the Azores and Senegambia. Its bathymetrical distribution is from 150 to 982 fathoms. It is found as a fossil in Norway and Calabria.

Sowerby mentions a gigantic *Lima* from Japan, *Lima goliath*<sup>1)</sup>, which was subsequently found again by the Challenger Expedition south of Japan in 775 fathoms, and west of South Patagonia in 245 fathoms<sup>2)</sup>. It is distinguished from the Scandinavian *Lima excavata* by its more convex shell, a somewhat different striation, and a larger and deeper cardinal area. In *Lima excavata*, however, even in specimens from the same locality, the form and striation of the shell vary very considerably. We have, for instance, a number of specimens from the Nord Fjord, which in these respects cannot be distinguished from Sowerby's species. The cardinal area appears to have more significance, although it too varies greatly. It is therefore a question whether *Lima goliath*, Sow. should not properly be considered as a gigantic variety of *Lima excavata*, Fabr.

**Lima loscombii**, Sowerby.

*Lima loscombii*, Sowerby, Genera, Rec. & Foss. Shells, 1820, fig. 4.

— — Forbes & Hanley, Brit. Moll. vol. 2, 1853, p. 265, Pl. 53, figs. 1—3.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 25.

*Lima loscombii* toges af Nordhavsekspektionen ved Husø, 40—60 fv. og ved stat. 192, 649 fv.

Den er almindelig ved den norske syd- og vestkyst op til Lofoten (Skraaven). Arten er forøvrigt kjendt fra Middelhavet og det nordøstlige af Atlanterhavet mellem Lofoten og Færoerne i nord og Azorerne og kysten af Senegambien i syd. Desuden har Challengerexpeditionen den fra Tristan da Cunha og Nightingale Island i Sydhavet. Den bathymetriske udbredelse er 20—1440 fv. Fossil er den funden i Norge, Belgien, Italien og Rhodes.

*Lima loscombii* was taken by the North Atlantic Expedition at Husø in depths of from 40 to 60 fathoms, and at Station 192 in 649 fathoms.

It is common off the south and west coasts of Norway, as far north as Lofoten (Skraaven). The species is also known in the Mediterranean and the north-eastern regions of the Atlantic between Lofoten and the Faroe Isles in the north, and the coast of Senegambia in the south. It was also found by the Challenger Expedition off Tristan da Cunha and Nightingale Island in the South Pacific. Its bathymetrical distribution is from 20 to 1440 fathoms. It is found as a fossil in Norway, Belgium, Italy and Rhodes.

<sup>1)</sup> Sowerby. Descriptions of five new species of shells. Proc. Zool. Soc., 1883, p. 30, tab. 7, fig. 3.

<sup>2)</sup> Smith. Rep. on Lamellibranchiata, Rep. Sci. Res. Chal. Exp., Zool. vol. 13, part 35, p. 290.

<sup>1)</sup> Sowerby. Descriptions of Five New Species of Shells. Proc. Zool. Soc., 1883, p. 30, Pl. VII, fig. 3.

<sup>2)</sup> Smith. Report on Lamellibranchiata. Rep. Sci. Res. Chal. Exp.; Zool. Vol. 13, part 35, p. 290.

**Lima elliptica, Jeffreys**

*Lima elliptica*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 81, vol. 5, p. 169, Pl. 25, fig. 2.

*Limatula* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 25.

Denne art, som kun foreligger i nogle faa exemplarer fra Husø, 40—60 fv., har ved den norske kyst samme udbredelse som foregaaende. Den forekommer langs hele Europas vestkyst samt i Middelhavet. Jeffreys anfører den desuden fra Newfoundland, den mexikanske Golf og Japan. Den bathymetriske udbredelse er 10—1060 fv. Fossil skal den ifølge Jeffreys være funden i Norge, Belgien, Ungarn Italien og Rhodes. For Norges vedkommende maa det dog antagelig bero paa en feilangivelse, idet Sars udtrykkelig fremhæver, at den ikke er funden fossil hos os.

I sit arbeide over „Willem Barents“ expeditionens lamellibranchiater anfører Haren Norman denne art fra Barentshavet<sup>1)</sup>, men maa dette formodentlig bero paa en forvexling med *Lima subovata*, som synes at være en mere hoinordisk art. *Lima subovata* anfores ogsaa af Jeffreys som funden af den hollandske arktiske expedition<sup>2)</sup>.

This species, of which there are only a few specimens from Husø, from depths of from 40 to 60 fathoms, has the same distribution on the Norwegian coast as the preceding species. It occurs all along the west coast of Europe, and in the Mediterranean. Jeffreys also states its occurrence off Newfoundland, in the Gulf of Mexico, and Japan. Its bathymetrical distribution is from 10 to 1060 fathoms. According to Jeffreys, it is found in a fossil state in Norway, Belgium, Hungary, Italy, and Rhodes. As regards Norway, however, this must be a misstatement, for Sars lays stress upon the fact that it is not found as a fossil in Norway.

Haren Norman, in his work on the Lamellibranchiata of the 'Willem Barents' Expedition, mentions this species as occurring in the Barents Sea<sup>1)</sup>, but he has probably confounded it with *Lima subovata*, which seems to be a more northerly species. *Lima subovata* is also mentioned by Jeffreys as found by the Dutch arctic expedition<sup>2)</sup>.

**Lima subovata, Jeffreys.**

*Lima subovata*, Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 18, 1866, p. 427.

— — Jeffreys, Proc. Zool. Soc., 1879, p. 563, Pl. 45, fig. 2.

**Findested.** Stat. 18, 173 b, 192 (flere døde skaller), 195, 290, 323. Dybde 107—649 fv.

Det største exemplar havde en længde af 14 mm.

*Lima subovata* er tidligere kjendt fra Middelhavet og det nordlige af Atlanterhavet med tilstødende dele af Ishavet. Artens sydgrændse er ved Azorerne. Den bathymetriske udbredelse er 16—1450 fv. Fossil er den funden ved Palermo.

**Locality.** Stations 18, 173 b, 192 (several empty valves), 195, 290, 323. Depth 107—649 fathoms.

The largest specimen was 14 mm. in length.

*Lima subovata* had previously been found in the Mediterranean and the northern part of the Atlantic Ocean with the adjoining parts of the Arctic Ocean. Its southern limit is the Azores. Its bathymetrical distribution is from 16 to 1450 fathoms. It is found as a fossil at Palermo.

**Lima sarsii, Lovén.**

*Lima crassa*, Forbes (?), Rep. Brit. Assoc. Adv. Sci., 1843, p. 193.

*sarsii*, Lovén, Ind. Moll. Scand., 1846, p. 32.

*Limatula crassa*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 26.

*Lima sarsii* fandtes paa stationerne 173 b, 192 og 195. Dybde 107—649 fv.

Forbes *crassa* har muligens prioriteten, men dennes mindre gode beskrivelse vanskeliggjør identificeringen. Vi har derfor ligesom Jeffreys foretrukket at bruge Lovéns navn, *sarsii*.

*Lima sarsii* was found at Stations 173 b, 192, and 195. Depth 107—649 fathoms.

Forbes's name, *crassa*, possibly has the priority, but its imperfect description makes identification difficult. Like Jeffreys, we have therefore preferred to employ Lovén's name, *sarsii*.

<sup>1)</sup> Niederländ. Arch. f. Zool. Suppl. I. Die Lamellibranchiaten, p. 4.

<sup>2)</sup> Proc. Zool. Soc., 1879, p. 563.

<sup>1)</sup> Nederland. Arch. f. Zool., Suppl. I. Die Lamellibranchiaten, p. 4.

<sup>2)</sup> Proc. Zool. Soc., 1879, p. 563.

*Lima sarsii* forekommer sparsomt langs vor vest- og nordkyst op til Vadsø, men synes ganske at mangle langs sydkysten. Arten er desuden funden langs hele Europas vestkyst samt i Middelhavet og ved St. Helena. Den bathymetriske udbredelse er 50—1417 fv. Fossil er den kjendt fra Sicilien og Rhodes.

*Lima sarsii* occurs sparingly along the west coast of Norway, and the north coast up to Vadsø, but seems to be altogether absent from the south coast. The species is found, moreover, along the entire west coast of Europe, in the Mediterranean, and at St. Helena. Its bathymetrical distribution is from 50 to 1417 fathoms. It is known as a fossil in Sicily and Rhodes.

#### **Pecten fragilis, Jeffreys.**

*Pecten fragilis*, Jeffreys, Ann. & Mag. Nat. Hist. ser. 4, vol. 18, 1876, p. 424.

— Jeffreys, Proc. Zool. Soc., 1879, p. 591, Pl. 45, fig. 1.

**Findested.** Stat. 35, 40, 51, 53, '96, 205, 240, 248, 295, 303, 312, 353. Dybde 658—1539 fv.

De største exemplarer var indtil 25 mm. lang, 23 mm. bred.

Denne ægte dybvandsform hører hjemme paa de store oceandyb mellem Spitsbergen og Grønland i nord og Cape Hatteras og Senegambien i syd. Den bathymetriske udbredelse er 658—1785 fv.

**Locality.** Stations 35, 40, 51, 53, 96, 205, 240, 248, 295, 303, 312 and 353. Depth 658—1539 fathoms.

The largest specimens were as much as 25 mm. in length, and 23 mm. in breadth.

This true deep-water form inhabits the great ocean depths between Spitsbergen and Greenland to the north, and Cape Hatteras and Senegambia to the south. Its bathymetrical distribution is from 658 to 1785 fathoms.

#### **Pecten imbrifer, Lovén.**

*Pecten imbrifer*, Lovén, Ind. Moll. Scand., 1846, p. 31.

*hoskynsi*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 30. Pl. 2, fig. 1 a—c.

Verrills beskrivelse af *cyclopecten pustulosus* i sit arbejde over familien *pectinidæ*<sup>1)</sup> stemmer i det store hele overens med den nordeuropæiske *pecten imbrifer*, Lovén, dog er hos den amerikanske form de radierende ribber paa venstre skallet mere faatallige. Dette byder imidlertid neppe noget fuldt tilfredsstillende artsmerke, hvorfor vi maa anse den nordamerikanske form identisk med den europæiske. Verrills tegning (tab. 19, fig. 3, 4) kan vi dog vanskelig bringe i overensstemmelse med hans tidligere af *pecten pustulosus*. Hans *cyclopecten subimbrifer* (p. 84), som han i tidligere arbejder har identificeret med den nordeuropæiske art, turde derimod være forskjellig fra denne.

**Findested.** Stationerne 48, 164, 192, 237, 262, 270, 290, 323, 357. Dybde 125—649 fv.

De høiarktiske exemplarer udmærker sig fra de ved den norske kyst forekommende ved sin størrelse. Medens disse ikke bliver mere end 11 mm., var exemplarer, som maalte 20 mm., ikke sjældne blandt hine. Et 20 mm. langt exemplar fra stat. 237 nærmede sig meget den af Posselt i *Conspectus Fauna Groenlandicæ* (p. 13, tab. 1, fig. 1) beskrevne varietet *lamellosa*.

Verrill's description of *Cyclopecten pustulosus*, in his work on the *Pectinidæ* family<sup>1)</sup>, agrees on the whole with the North European *Pecten imbrifer*, Lovén, although the radiating ribs on the left valve in the American form are fewer in number. This, however, scarcely constitutes an altogether satisfactory specific feature, and we must therefore regard the North American form as identical with the European. We have some difficulty, however, in making Verrill's drawing (Pl. XIX, figs. 3, 4) agree with his earlier one of *Pecten pustulosus*. On the other hand, his *Cyclopecten subimbrifer* (p. 84), which, in earlier works, he has identified with the North-European species, possibly differs from it.

**Locality.** Stations 48, 164, 192, 237, 262, 270, 290, 323, and 357. Depth 125—649 fathoms.

The high-arctic specimens are distinguished from those occurring on the Norwegian coast by their size; for whereas the latter do not attain more than 11 mm., specimens measuring 20 mm. were not uncommon among the former. One of these, measuring 20 mm. in length, from Station 237, bore a great resemblance to the variety *lamellosa*, described by Posselt in „*Conspectus Fauna Grœnlandica*“ (p. 13, Pl. I, fig. 1).

<sup>1)</sup> Trans. Connecticut Acad., vol. 10, 1897, p. 83.

<sup>1)</sup> Trans. Connecticut Acad., vol. 10, 1897, p. 83.



*Pecten imbrifer* forekommer paa de større dyb langs vor vest- og nordkyst. Ved sydkysten synes den derimod at mangle. Den er endvidere kjendt fra Karahavet, Novaja Semlja, Barentshavet, Spitsbergen, Færøerne, Island, Grønland og Nordamerikas østkyst. Artens udbredelse mod syd kan for tiden ikke med sikkerhed angives, da den hos et flertal af forfattere har været sammenblandet med den nærstaaende af Forbes fra Ægeerhavet beskrevne *pecten hoskynsi*. Den bathymetriske udbredelse er 30—650 fv. Fossil er den funden i Norge og Italien.

*Pecten imbrifer* occurs in the great depths along the west and north coasts of Norway, but appears, to be absent from the south coast. It has also been found in the Kara Sea, Novaja Semlja, the Barents Sea, Spitsbergen, the Faroe Isles, Iceland, Greenland, and on the east coast of North America. Its distribution southwards cannot at present be stated with certainty, as the majority of writers have confounded it with the nearly-allied *Pecten hoskynsi* from the Ægean Sea, described by Forbes. Its bathymetrical distribution is from 30 to 650 fathoms. It is found as a fossil in Norway and Italy.

### *Pecten grønlandicus*, Sowerby.

*Pecten grønlandicus*, Sowerby, Thes. Conch., part 1, 1847. p. 57, Pl. 13, fig. 40.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878. p. 23, Pl. 2, fig. 4 a—c.

**Findested.** Stationerne 223, 224, 257, 261, 262, 267, 270, 273, 323, 326, 338, 363; Jan Mayen, 30 fv. og Advent Bay, 30 fv. Dybde 30—260 fv.

Medens denne art ved vor kyst ikke blir mere end 15 mm. lang, maalte exemplarerne fra Spitsbergen indtil 24 mm.

*Pecten grønlandicus* forekommer ved vor kyst ikke søndenfor Tromsø. Forøvrigt er den en circumpolar art, som er kjendt fra Sibiriens ishavskyster Karahavet, Novaja Semlja, Spitsbergen, Frants Josefsland, Hvidehavet, Jan Mayen, Island, Grønland, arktisk Nordamerika, golfen ved St. Laurence og det nordlige af Atlanterhavet indtil vest af Senegambien. Den bathymetriske udbredelse er 3—713 fv. Fossil er den funden i Grinnelland, Maine, Skotland, Norge, det nordlige Rusland og Sibirien.

**Locality.** Stations 223, 224, 257, 261, 262, 267, 270, 273, 323, 326, 338 and 363; Jan Mayen in 30 fathoms, and Advent Bay in 30 fathoms. Depth 30 to 260 fathoms.

While this species does not attain a length of more than 15 mm. on the coast of Norway, specimens from Spitsbergen measured as much as 24 mm.

*Pecten grønlandicus* does not occur on the Norwegian coast south of Tromsø. It is furthermore a circumpolar species, known on the Arctic shores of Siberia, in the Kara Sea, Novaja Semlja, Spitsbergen, Franz Josef Land, the White Sea, Jan Mayen, Iceland, Greenland, arctic North America, the Gulf of St. Lawrence, and the North Atlantic down to the west of Senegambia. Its bathymetrical distribution is from 3 to 713 fathoms. It is found as a fossil on Grinnell Land, in Maine, Scotland, Norway northern Russia, and Siberia.

### *Pecten similis*, Laskey.

*Pecten similis*, Laskey, Mem. Werner. Soc., vol. 1, 1811, p. 387, Pl. 8, fig. 8.

— — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 293, Pl. 52, fig. 6, Pl. S, fig. 1.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 22.

*Pecten similis* foreligger kun fra en lokalitet, Husø, 40—60 fv. Den er almindelig paa de større dyb ved vor syd- og vestkyst. Nordenfor Lofoten blir den mere sjelden, men er dog funden helt op til Vadsø. Mod syd gaar denne art til Madeira, Middelhavet, Adriaterhavet og Ægeerhavet. Den bathymetriske udbredelse er 15—703 fv. Fossil er den funden i England, Belgien, Italien og Rhodes.

*Pecten similis* was only found in one locality, namely Husø, in depths of from 40 to 60 fathoms. It is common in the deep water off the south and west coasts of Norway. It is rarer north of Lofoten, but is found as far north as Vadsø. Southwards it extends to Madeira, the Mediterranean, the Adriatic, and the Ægean Seas. Its bathymetrical distribution is from 15 to 703 fathoms. It is found as a fossil in England, Belgium, Italy and Rhodes.

**Pecten incomparabilis, Risso.**

*Pecten incomparabilis*, Risso, Hist. Eur. Mer., vol. 4, 1826, p. 302, fig. 154.

— *furtivus*, Lovén, Ind. Moll. Scand., 1846, p. 31.

— *testæ*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 19.

Denne art fandtes af Nordhavsekspektionen kun ved Bodø, 40—60 fv. Ved den norske kyst forekommer den op til Lofoten. Mod syd gaar den til Middelhavet, Senegambien og Azorerne. Den bathymetriske udbredelse er 10—1000 fv. Fossil er *pecten incomparabilis* kjendt fra Italien.

This species was found by the North Atlantic Expedition only at Bodø, in depths of from 40 to 60 fathoms. On the Norwegian coast it occurs northwards as far as Lofoten. Southwards it extends to the Mediterranean, Senegambia, and the Azores. Its bathymetrical distribution is from 10 to 1000 fathoms. It is known as a fossil in Italy.

**Pecten striatus, O. F. Müller.**

*Pecten striatus*, O. F. Müller, Prodr. Fau. Dan., 1776, p. 248.

— — O. F. Müller, Zool. Dan., 1788, vol. 2, p. 26, Pl. 60, figs. 3, 5.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 19.

*Pecten striatus* fandtes ved Husø og Bodø, 40—60 fv. Den er kjendt langs hele den norske kyst op til Havø-sund (Finmarken). Den er en østatlantisk art, som er udbredt langs Europas vestkyst fra Finmarken og Færøerne til Middelhavet. Den bathymetriske udbredelse er 5—458 fv. Fossil er den funden i Skandinavien, England og Italien.

*Pecten striatus* was found at Husø and Bodø, in depths of from 40 to 60 fathoms. It is known all along the Norwegian coast up to Havø-sund (Finmarken). It is an east-Atlantic species, which is distributed along the west coast of Europe, from Finmark and the Faroe Isles to the Mediterranean. Its bathymetrical distribution is from 5 to 458 fathoms. It is found in the fossil state in Scandinavia, England and Italy.

**Pecten tigrinus, O. F. Müller.**

*Pecten tigrinus*, O. F. Müller, Prodr. Zool. Dan., 1776, p. 248.

— — O. F. Müller, Zool. Dan., 1788, vol. 2, p. 26, Pl. 60, figs. 6—8.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 18.

Et dødt exemplar fandtes paa stat. 173 b, 300 fv.

A dead specimen was found at Station 173 b, in 300 fathoms.

Arten forekommer almindelig langs hele den norske kyst op til Nordkap. Mod syd gaar den til Spanien (Vigo). Den bathymetriske udbredelse er 5—300 fv. Fossil er den funden i Norge, England, Spanien og Italien.

The species is common all along the Norwegian coast up to the North Cape. It extends southwards as far as Spain (Vigo). Its bathymetrical range is from 5 to 300 fathoms. It is found as a fossil in Norway, England, Spain and Italy.

**Pecten vitreus, Chemnitz.**

*Pallium vitreum*, Chemnitz, Conch. Cab., vol. 7, 1782, p. 335, Pl. 67, fig. 637 a.

*Pecten vitreus*, Gmelin, Syst. Nat., ed. 13, 1789, p. 3328.

— — Jeffreys, Brit. Conch., vol. 5, 1869, p. 168, Pl. 99, fig. 6.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 21, Pl. 2, fig. 5 a—b.

**Findested.** Stationerne 1, 9, 51 (et ganske ungt, dødt skal, som synes at tilhøre denne art), 192 (døde skaller), 255, 257 samt ved Husø, 100 fv., og Sognefjord, 100 fv. Dybde 100—1163 fv.

**Locality.** Stations 1, 9, 51 (an empty shell of quite a young specimen that seemed to belong to this species), 192 (empty valves), 255 and 257, and also at Husø in 100 fathoms, and in the Sogne Fjord in 100 fathoms. Depth 100—1163 fathoms.

Exemplarerne tilhører dels hovedformen, *pecten vitreus*, dels den tyndere, glatte, mere hyaline *pecten abyssorum*, Lovén<sup>1)</sup>. Da der mellem disse to former findes overgange, kan vi ikke som Sars og Locard betragte den sidstnævnte som en selvstændig art, men maa med Jeffreys, Norman og Verrill anse den som en dybrandsvaret af *pecten vitreus*.

Begge former træffes paa de større dyb langs den norske kyst op til Nordkap. *Pecten vitreus* synes at være en kosmopolitisk art, som er kjendt fra Grønland, de europæiske og nordamerikanske Atlanterhavskyster, Middelhavet, Kanariske øer, Azorerne, Nordafrikas vestkyst, Sargassohavet, vest af Sydpatagonien, syd af Japan og Philippinerne. Den bathymetriske udbredelse er 50—2263 fv. Fossil er den kjendt fra Norge og Sicilien.

Some of the specimens belong to the principal form *P. vitreus*, and some to the smooth, thinner, more hyaline *P. abyssorum*, Lovén<sup>1)</sup>. As there are transition forms between these two, we cannot, like Sars and Locard, regard the last-named as an independant species, but, with Jeffreys, Norman, and Verrill, must consider it to be a deep-water variety of *P. vitreus*.

Both forms are met with in the deep water off the Norwegian coast up to the North Cape. *P. vitreus* seems to be a cosmopolitan species, known in Greenland, on the European and North American shores of the Atlantic, in the Mediterranean, the Canary Isles, and the Azores, on the north-west coast of Africa, in the Sargasso Sea, on the west coast of South Patagonia, off the south coast of Japan, and the Philippine Islands. Its bathymetrical distribution is from 50 to 2263 fathoms. It is known as a fossil in Norway and Sicily.

### *Pecten islandicus*, O. F. Müller.

*Pecten islandicus*, O. F. Müller, Prodr. Fau. Dan., 1776, p. 248.

— — Fabricius, Fau. Grøn., 1780, p. 415.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 16, Pl. 2, fig. 2.

**Findested.** Stationerne 270, 275, 312 (døde skaller), 336; Bodo, Advent Bay og Magdalena Bay 40—60 fv. Fra de fleste lokaliteter foreligger den i talrige eksemplarer. Dybde 40—147 fv. (658 fv.).

Ved den norske kyst har *pecten islandicus* sin sydgrændse ved Bergen, hvor den dog blot forekommer i dværgagtig smaa eksemplarer. Den er en circumpolar art, som er kjendt fra Karahavet, Novaja Semlja, Barentshavet, Spitsbergen, Jan Mayen, Murmankysten, Island, Grønland, Amerikas nord- og østkyst indtil Connecticut, Beringshavet, Kamtschatka og det nordlige Japan. Døde skaller er fundne i Kattegat, Nordsoen, ved de britiske kyster, Biskayerbugten og ved Neapel og Messina, men disse er oiensynlig subfossile. Den bathymetriske udbredelse er 5—170 fv. Til eksemplarerne fra stat. 312, 658 fv., kan der ikke tages hensyn, da de var døde. Af samme grund maa vi ogsaa bortse fra Caudanexpeditionens stat. 19 (213 fv.) i Biskayerbugten. Fossil er *pecten islandicus* kjendt fra Spitsbergen, Skandinavien, nordlige Rusland, England, Grønland, Sibirien og Spitsbergen.

**Locality.** Stations 270, 275, 312 (empty valves), and 336, Bodo, Advent Bay and Magdalena Bay (40—60 fathoms). The specimens from most of these localities are numerous. Depth 40—147 fathoms (658 fathoms).

Off the Norwegian coast, *Pecten islandicus* has its southern limit at Bergen, where, however, only small dwarfish specimens occur. It is a circumpolar species, found in the Kara Sea, Novaja Semlja, the Barents Sea, off Spitsbergen, Jan Mayen, the Murman Coast, Iceland, and Greenland, the north and east coasts of North America down to Connecticut, in the Bering Sea, Kamtschatka, and northern Japan. Empty shells have been found in the Kattegat and the North Sea, off the British coasts, in the Bay of Biscay, and off Naples and Messina; but these are evidently sub-fossil. Its bathymetrical distribution is from 5 to 170 fathoms. No notice can be taken of the specimens from Station 312 (658 fathoms), as they were not living; and for the same reason we must disregard those from Station 19 of the Caudan Expedition, in the Bay of Biscay (213 fathoms). *P. islandicus* is known as a fossil in Spitsbergen, Scandinavia, northern Russia, England, Greenland and Siberia.

<sup>1)</sup> *Pecten abyssorum*, M. S. Lovén, Asbjørnsen, Bidrag til Christianiafjordens litoralfauna. Nyt Mag. f. Naturvidensk., vol. 7, 1853, p. 352. M. Sars, Bidrag til kundskab om Christianiafjordens fauna. II. Op. cit. vol. 17, 1870, p. 211. G. O. Sars, Moll. Reg. Arct. Norv., 1870, p. 22, tab. 2, fig. 6 a—c.

<sup>1)</sup> *P. abyssorum*, M. S. Lovén, Asbjørnsen, Bidrag til Christianiafjordens Litoralfauna. Nyt Mag. f. Naturvidensk., vol. 7, 1853, p. 352. M. Sars, Bidrag til Kundskab om Christianiafjordens Fauna. II. Op. cit., vol. 17, 1870, p. 211. G. O. Sars, Moll. Reg. Arct. Norv. 1870, p. 22. Pl. 2, figs. 6 a—c.



**Pecten septemradiatus, O. F. Müller.**

*Pecten septemradiatus*, O. F. Müller, Prodr. Fau. Dan., 1776, p. 248.

— *triradiatus*, O. F. Müller, Op. cit., p. 248.

— — O. F. Müller, Fau. Dan., vol. 2, 1788, p. 25, Pl. 60, figs. 1—2.

— *septemradiatus*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 18.

Døde skaller af denne art fandtes paa stat. 10, 220 fv. og stat. 149, 149 fv.

*Pecten septemradiatus* er almindelig langs hele den norske kyst op til Varangerfjorden. Artens sydgrænse er ved de Canariske øer og Nordafrikas vestkyst. Den bathymetriske udbredelse er 30—1066 fv. Fossil er den funden i Skandinavien og de britiske øer.

Empty valves of this species were found at Station 10 in 220 fathoms, and Station 149 in 149 fathoms.

*Pecten septemradiatus* is common all along the Norwegian coast up to the Varanger Fjord. The southern limit of the species is at the Canary Isles and the north-west coast of Africa. Its bathymetrical distribution is from 30 to 1066 fathoms. It is found as a fossil in Scandinavia and the British Isles.

**Pecten sulcatus, O. F. Müller.**

*Pecten sulcatus*, O. F. Müller, Prodr. Zool. Dan., 1776, p. 248.

— — Lovén, Ind. Moll. Scand., 1846, p. 30.

— *aratus*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 64, vol. 5, p. 167, Pl. 99, fig. 5.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 17, tab. 2, fig. 3 a—b.

Stat. 9, 206 fv., var den eneste localitet, hvor denne art blev tagen af Nordhavsekspektionen.

Denne vakre art forekommer hyppig langs vor syd- og vestkyst op til Lofoten. Mod syd gaar den til Nordafrikas vestkyst og Middelhavet. Vi er nemlig enig med Jeffreys i, at den middelhavske *pecten bruei* og *pecten sulcatus* er identiske. En sammenligning mellem eksemplarer af *pecten bruei* Paysaudeau fra Korsika og typiske eksemplarer af den nordiske *pecten sulcatus*, viser ikke nogen væsentlig forskjel, der kan berettigge opretholdelsen af Paysaudeaus art. Den bathymetriske udbredelse er 12—909 fv. Fossil er *pecten sulcatus* funden i vore yngre glaciële skjælbanker og i Belgiens coralline crag.

Station 9 (206 fathoms) was the only locality in which this species was found by the North Atlantic Expedition.

This beautiful species is frequently met with along the Norwegian coast as far north as Lofoten. Southwards it extends to the north-west coast of Africa and the Mediterranean. We agree with Jeffreys in considering the Mediterranean species, *P. bruei*, to be identical with *P. sulcatus*. A comparison of specimens of *P. bruei*, Paysaudeau, from Corsica, with typical specimens of the northern *P. sulcatus*, we see no essential difference that can justify the maintaining of Paysaudeau's species. Its bathymetrical distribution is from 12 to 909 fathoms. *P. sulcatus* is found as a fossil in the Norwegian shell banks of the Later Glacial Period, and in the Belgian coralline crag.

**Malletia obtusa, M. Sars.**

*Yoldia abyssicola*, M. Sars, Christiania Vidensk. Selsk. Forhdl., 1859, p. 86.

— *obtusa*, M. Sars in G. O. Sars, Remark. Forms Anim. Life, vol. 1, 1872, p. 23, Pl. 3, figs. 16—20.

*Malletia* — Mørch, Forhandl. skandinaviske Naturforsk. 11te møde, 1873, p. 370.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 41, Pl. 19, fig. 3 a—b.

**Findested.** Stationerne 1, 2, 149 og 255. Dybde 135—672 fv.

*Malletia obtusa*, som først fandtes af M. Sars, forekommer paa de større dyb langs vor vestkyst op til Lofoten. Den er endvidere funden paa de store oceandyb udenfor de britiske øer, Frankrig, Spanien,

**Locality.** Stations 1, 2, 149, and 255. Depth 135—672 fathoms.

*Malletia obtusa*, which was first found by M. Sars, occurs in the deep water along the west coast of Norway up to Lofoten. It is moreover found in the ocean depths off the British Isles, France,

Portugal og Nordafrika indtil Cap Verd. Ligeledes er den tagen i Middelhavet og paa talrige lokaliteter udenfor Nordamerikas østkyst mellem Nova Scotia og Cape Hatteras. Den bathymetriske udbredelse er 135—1702 fv.

Spain, Portugal, and the north of Africa down to Cape Verd. It has also been found in the Mediterranean, and in numerous localities off the east coast of North America between Nova Scotia and Cape Hatteras. Its bathymetrical distribution is from 135 to 1702 fathoms.

#### **Malletia cuneata**, Jeffreys.

*Solenella cuneata*, Jeffreys, Rep. Brit. Assoc., 1873, p. 112.

*Malletia* — Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 18, 1876, p. 435.

— — Jeffreys, Proc. Zool. Soc., 1879, p. 586, Pl. 40, fig. 10.

**Findested.** Stationerne 52, 183, 213 og 353. Dybde 1333—1861 fv.

Denne dybvandsart er kun kjendt fra de store Atlanterhavsdyb. Nordgrænsen for artens udbredelse er ved Spitsbergen og munden af Baffinsbugten; mod syd gaar den til troperne. Desuden er den funden paa flere lokaliteter i Middelhavet. Den bathymetriske udbredelse er 295—2260 fv.

**Locality.** Stations 52, 183, 213 and 353. Depth 1333—1861 fathoms.

This deep-water species has only been found in the great depths of the Atlantic. The northern limit of its distribution is off Spitsbergen and at the mouth of Baffin's Bay; southwards it extends to the tropics. It is also found in several places in the Mediterranean. Its bathymetrical distribution is from 295 to 2260 fathoms.

#### **Yoldia hyperborea**, Lovén.

*Yoldia hyperborea*, Lovén, Torell, Spitzberg. Moll, 1859, p. 149, Pl. 2, fig. 6 a—b.

— — Leche, Vega Exp. Vetensk. Iakttag., vol. 3, 1883, p. 444, Pl. 33, figs. 16, 17.

Vi har havt anledning til at sammenligne Nordhavs-expeditionens materiale med typiske eksemplarer af de amerikanske former *yoldia limatula*, Say og *yoldia sapotilla*, Gould samt med Sars's *yoldia limatula* og Torells original eksemplar af *yoldia hyperborea*. At dømme efter dette materiale synes *yoldia sapotilla* at slutte sig nær *yoldia hyperborea*, dog er hos denne næbbet afrundet, medens det hos *yoldia sapotilla* er mere skraat afskaaret. I skallets vækstlinier træder denne forskjel tydelig og skarpt frem (cfr. Gould, Rep. on Invert. of Massachusetts, ed. 1, 1841, fig. 61). Endvidere synes *yoldia hyperborea* at have flere laastænder, vi har hos denne fundet 22—26/16—22, medens *yoldia sapotilla* blot har 16—18 paa hver side. Forøvrigt afviger disse to former ikke fra hinanden, hos dem begge er saaledes skallets høide lig eller noget større end den halve længde.

I modsætning til Verrill, der betragter Sars's *limatula* for identisk med *hyperborea*, Lovén, men forskjellig fra *limatula*, Say<sup>1)</sup>, kan vi ikke opdage nogen væsentlig forskjel mellem den norske og den amerikanske form, kun synes den sidste at have noget færre laastænder, 22/18, men dette antal kan dog ogsaa findes hos den norske. *Yoldia limatula*, Say, har den samme langstrakte form som Sars's, hos dem begge er skallets høide mindre end den halve længde; kun hos ganske unge eksemplarer er den lig.

We have had an opportunity of comparing the specimens from the North Atlantic Expedition with types of the American *Yoldia limatula*, Say, and *Yoldia sapotilla*, Gould, and with *Y. hyperborea*, Lovén, from Spitsbergen (original specimen from Torell), and *Y. limatula*, G. O. Sars, from various localities of northern Norway. From this it appears that *Y. sapotilla* is nearly allied to *Y. hyperborea*, though the beak in the latter is rounded, while in *Y. sapotilla* it is more obliquely truncated. In the lines of growth this difference is very marked (cf. Gould, Rep. on Invert. of Massachusetts, 1st ed. 1841, fig. 61). *Y. hyperborea*, moreover, appears to have a greater number of hinge-teeth; we have found 22—26/16—22, while *Y. sapotilla* has only from 16 to 18 on each side. In other respects, these two forms do not differ from one another. The height of the shell, for instance, in both of them, is equal to, or rather more than, half the length.

Unlike Verrill, who regards Sars's *limatula* as identical with Lovén's *hyperborea*, but different from Say's *limatula*<sup>1)</sup>, we can discover no essential difference between the Norwegian and the American form, except that the latter appears to have rather fewer hinge-teeth (22/18); but the same number can also be found in the Norwegian form. *Y. limatula*, Say, has the same elongated form as that of Sars; in both of them the height of the shell is less than half the length. Only in quite young specimens is the height equal to half the length.

<sup>1)</sup> Trans. Connecticut Acad., vol. 6, 1884, p. 226.

<sup>1)</sup> Transac. Connecticut Acad., vol. 6, 1884, p. 226.



Forskjellen mellem *yoldia hyperborea*, *yoldia sapotilla* og *yoldia limatula* er saa liden, at de neppe bør opfattes som selvstændige arter. Som hovedform skulde vi anse *yoldia hyperborea*, da denne har det største udbredelsesomraade, og de to øvrige som varieteter og da *yoldia sapotilla* som en vestlig, amerikansk form og *yoldia limatula* som en væsentlig østlig europæisk; denne sidste forekommer dog ogsaa paa den amerikanske side. *Yoldia myalis*, Couthouy, har vi desværre ikke havt anledning til at undersøge, vi tør derfor ikke udtale os om denne, men er vi tilboielig til at slutte os til Posselts formening, at den ikke har noget med ovennævnte tre former at gjøre<sup>1)</sup>.

*Yoldia hyperborea* fandtes paa stat. 357, 125 fv., Norskøerne, 30 fv., Advent Bay, 20—40 fv., og Magdalena Bay, 20—40 fv. De største exemplarer maalte: 30 mm. lang, 16 mm. høi.

Den typiske *yoldia hyperborea* er en høiarktisk circumpolar art, som er kjendt fra Spitsbergen, nordlige Rusland, Novaja Semlja, Karahavet, Sibiriens ishavskyster, Beringshavet, arktisk Nordamerika og Grønland. Den bathymetriske udbredelse er 8—350 fv. Knipowitsch anfører den som fossil fra det nordlige Rusland.

The difference between *Yoldia hyperborea*, *Y. sapotilla*, and *Y. limatula* is, indeed, so small that they ought scarcely to be regarded as independent species. We should consider *Y. hyperborea* as the principal form, and the two others as varieties, *Y. sapotilla* as a western, American form, and *Y. limatula* as mainly east-European. The latter, however, also occurs on the American side. We have unfortunately had no opportunity of examining *Y. myalis*, Couthouy, and are therefore unable to give an opinion on the subject; but we are inclined to agree with Posselt in thinking that it is in no way connected with the three above-mentioned forms<sup>1)</sup>.

*Yoldia hyperborea* was found at Station 357 in 125 fathoms, off the Norwegian Islands (Spitsbergen) in 30 fathoms, and in Advent Bay and Magdalena Bay in from 20 to 40 fathoms. The largest specimens measured 30 mm. in length, and 16 mm. in height.

The typical *Y. hyperborea* is a high-arctic, circumpolar species found off Spitsbergen, northern Russia, Novaja Semlja, the Kara Sea, on the Siberian shores of the Arctic Ocean, in the Bering Sea, arctic North America, and Greenland. Its bathymetrical distribution is from 8 to 350 fathoms. Knipowitsch states its occurrence as a fossil in northern Russia.

#### **Portlandia arctica, Gray.**

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|-------------------|--|
| <i>Nucula</i>     | <i>arctica</i> , Gray, Parry's First Voyage, Suppl. to. App., 1824, p. 251.      |
| <i>Yoldia</i>     | — Torell, Spitsbergens Mollusker, 1859, p. 145.                                  |
| —                 | — M. Sars, Foss. Dyrelevninger, 1865, p. 145.                                    |
| <i>Portlandia</i> | — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 37, Pl. 4, fig. 7 a—b.            |
| <i>Yoldia</i>     | — Leche, Vega Exp. Vetensk. Iagttag., vol. 3, 1883, p. 444, Pl. 33, fig. 18, 19. |

Døde skaller af denne art fandtes paa stationerne 312, 353 og 363. Da disse stationers dybde er 658 fv., 1333 fv. og 260 fv., er der grund til at antage, at exemplarerne er af drivisen ført ud paa dybet, thi *portlandia arctica* synes ikke at være nogen dybvandsform, dens bathymetriske udbredelse er 5—100 fv. Til denne art har vi under nogen tvil ogsaa henført en ung *portlandia* (long. 5 mm., alt 3 mm., crass. 2 mm.) fra stat. 290, 191 fv.

*Portlandia arctica* er en høiarktisk, circumpolar art, som er kjendt fra Grønland, arktisk Amerika, Beringshavet, Sibiriens ishavskyster, Karahavet, Novaja Semlja, Hvidehavet og Spitsbergen. Ved Norges kyster synes den ikke mere at forekomme levende, subfossil er den derimod funden saavel ved Lofoten som ved vestkysten. Fossil er *portlandia arctica* kjendt fra Norge, Skotland, Grønland, Canada, Sibirien og det nordlige Rusland.

Empty shells of this species were found at Stations 312, 353 and 363. As the depths at these stations are respectively 658, 1333, and 260 fathoms, there is reason to suppose that the specimens have been carried out by the drift-ice into deep water, for *Portlandia arctica* does not appear to be a deep-water form, its bathymetrical distribution being from 5 to 100 fathoms. There is also a young *Portlandia* (length 5 mm., height 3 mm., thickness 2 mm.) from station 290 (191 fathoms), which we have with some hesitation referred to this species.

*Portlandia arctica* is a high-arctic, circumpolar species, known in Greenland, arctic America, the Bering Sea, on the arctic shores of Siberia, in the Kara Sea, Novaja Semlja, the White Sea and Spitsbergen. It no longer seems to occur in a living state off the Norwegian coast; but on the other hand, it is found in a sub-fossil condition both off Lofoten and the west coast of Norway. *Portlandia arctica* is known as a fossil in Norway, Scotland, Greenland, Canada, Siberia and the north of Russia.

<sup>1)</sup> Consp. Fau. Grænländica, 1898, p. 31.

<sup>1)</sup> Consp. Fau. Grænländica, 1898, p. 31.



**Portlandia pustulosa**, Jeffreys,

*Leda pustulosa*, Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 18, 1876, p. 430.

Seguenza, Atti R. Accad. Lincei, 1877, p. 1177, Pl. 3, fig. 17.

Denne art erholdes kun paa stat. 31, 417 fv og stat. 273, 197 fv. Den er tidligere funden af „Valorous“ i munden af Davisstrædet, 1450 fv. „Porcupine“ har den fra Færøkanalen, 540 fv., Irlands nordvestkyst, 420—1476 fv., og fra flere stationer mellem England og Gibraltar. „Flying Fox“ har taget den ved Irlands sydvestkyst, 1000 fv., og „Travailleur“ udenfor Satander, 1042 fv. Fossil er *portlandia pustulosa* kjendt fra de pliocene lag i Syditalien.

This species was only found at Station 31 (417 fathoms), and Station 273 (197 fathoms). It was previously found by the ‘Valorous’ at the mouth of the Davis Straits, in 1450 fathoms; by the ‘Porcupine’ in the Faroe Channel (540 fathoms), off the north-west coast of Ireland (420—1476 fathoms), and at several stations between England and Gibraltar; by the ‘Flying Fox’ on the south-west coast of Ireland (1000 fathoms); and by the ‘Travailleur’ off Satander (1042 fathoms). *Portlandia pustulosa* is a fossil in the Pliocene beds of South Italy.

**Portlandia frigida**, Torell.

*Yoldia frigida*, Torell, Spitsbergens Moll., 1859, p. 148, Pl. 1, fig. 3.

— — Leche, Kongl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 25, Pl. 1, fig. 6 a—d.

*Portlandia* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 39, Pl. 4, fig. 11 a—b.

**Findested.** Sognefjord, 100 fv., og Advent Bay, 20—40 fv. samt stationerne 87, 192, 223, 225, 253, 260, 261, 267, 270, 338 og 357. Dybde 20—649 fv.

*Portlandia frigida* er almindelig langs hele den norske kyst. Den er endvidere kjendt fra Grønland, Nordamerikas østkyst indtil New Jersey, Middelhavet, Biskayerbugten, De britiske øer, Island, Murmankysten, Spitsbergen, Novaja Semlja og det nordlige Japan. Den bathymetriske udbredelse er 5—1360 fv. Den er funden fossil i Norge, Italien og Grønland.

**Locality.** The Sogne Fjord (100 fathoms), Advent Bay (20—40 fathoms), and Stations 87, 192, 223, 225, 253, 260, 261, 267, 270, 338, and 357. Depth 20—649 fathoms.

*Portlandia frigida* is common all along the coast of Norway. It is further found off Greenland, the east coast of North America down to New Jersey, in the Mediterranean, the Bay of Biscay, off the British Isles, Iceland, the Murman Coast, Spitsbergen, Novaja Semlja, and the north coast of Japan. Its bathymetrical distribution is from 5 to 1360 fathoms. It is found as a fossil in Norway, Italy, and Greenland.

**Portlandia tenuis**, Philippi.

*Nucula tenuis*, Philippi, Enum. Moll. Siciliæ, vol. 1, 1836, p. 65, Pl. 5, fig. 9.

— *pygmaea*, Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 230, Pl. 67, fig. 10.

— — Jeffreys, Brit. Conch., vol. 2, 1863, p. 154, Pl. 29, fig. 15.

*Portlandia tenuis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 38.

**Findested.** Sognefjord, 100 fv., og Alten, 30 fv., samt stationerne 1, 124, 137, 164, 175, 192, 195, 225, 251, 260, 261, 312, 326 (?) og 338. Dybde 30—658 fv.

Denne art, der er almindelig ved vor syd- og vestkyst op til Lofoten, forekommer langs Europas vestkyst og i Middelhavet. Den bathymetriske udbredelse er 10—1357 fv. Fossil er den funden i Italien.

**Locality.** The Sogne Fjord (100 fathoms), Alten (30 fathoms), and Stations 1, 124, 137, 164, 175, 192, 195, 225, 251, 260, 261, 312, 326 (?), and 338. Depth 30—658 fathoms.

This species, which is common off the south and west coasts of Norway up to Lofoten, occurs along the west coast of Europe and in the Mediterranean. Its bathymetrical distribution is from 10 to 1357 fathoms. It is found as a fossil in Italy.

**Portlandia subæquilatera, Jeffreys.**

*Yoldia pygmaea*, var. *symmetrica*, Friele, Nyt Mag. f. Naturvidensk., vol. 24, 1878, p. 222.

— *forma propinqua*, Leche, Kongl. Sv. Vetensk. Akad. Handl., vol. 14, no. 2, 1878, p. 26, Pl. 1, fig. 7 a—b.

*Leda subæquilatera*, Jeffreys, Proc. Zool. Soc., 1879, p. 579, Pl. 46, fig. 1.

*Portlandia subæquilatera* slutter sig nær til *portlandia tenuis*, fra hvilken den væsentlig adskiller sig ved sin mere ovale afrundede form. Det er derfor et spørgsmaal, om den ikke rettest burde opfattes som en varietet af denne.

**Findested.** Stationerne 18, 48, 124, 200, 225, 248 og 362. Dybde 195—778 fv.

*Portlandia subæquilatera* er tidligere kjendt fra de store oceandyb udenfor Europas og Nordamerikas kyster. Sydgrænsen for artens udbredelse er ved Azorerne og Den mexikanske golf. Den bathymetriske udbredelse er 92—1731 fv.

*Portlandia subæquilatera* is nearly allied to *P. tenuis*, from which it is distinguished by its more oval, rounded shape. It is a question whether it ought not more properly to be regarded as a variety of that species.

**Locality.** Stations 18, 48, 124, 200, 225, 248, and 362. Depth 195—778 fathoms.

*Portlandia subæquilatera* is known to occur in the great ocean depths off the coasts of Europe and North America. Its southern limit is at the Azores and the Gulf of Mexico. Its bathymetrical distribution is from 92 to 1731 fathoms.

**Portlandia lenticula, Møller.**

*Nucula lenticula*, Møller, Ind. Moll. Grønland, 1842, p. 17.

*Yoldia abyssicola*, Torell, Spitsbergens Moll., 1859, p. 149, Pl. 1, fig. 4 a—b.

— *pygmaea*, var. *gibbosa*, M. Sars, Foss. Dyrelevninger, 1865, p. 38, figs. 75—83.

*Portlandia lenticula*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 39, Pl. 4, fig. 10 a—b.

**Findested.** Stationerne 257, 261, 290, 326, 357 samt ved Rognan, Salten, 20 fv. Dybde 20—191 fv.

*Portlandia lenticula* er efter al sandsynlighed en circumpolar art, idet dens udbredelse strækker sig fra Wellington Kanalen og Grønland til øst for Taimurhalvoen (116° Ø. L.). Dens sydgrænse er ved Nordafrikas vestkyst. Paa de sydligere findesteder synes den dog blot at være tagen subfossil. Den forekommer langs Norges vest- og nordkyst, søndenfor Bodø er den dog sjelden. Den bathymetriske udbredelse er 20—656 fv. Fossil er den funden i Norge, England, nordlige Rusland, Sibirien og Nordamerika.

**Locality.** Stations 257, 261, 290, 326, and 357, and Rognan, Salten (20 fathoms). Depth 20—191 fathoms.

*Portlandia lenticula* is in all probability a circumpolar species, as its range is from Wellington Channel and Greenland to the east of the Taimur Peninsula (116° E. Long.). Its southern limit is the north-west coast of Africa; but it appears to be only sub-fossil in the more southern localities. It occurs along the west and north coasts of Norway, although not common south of Bodø. Its bathymetrical distribution is from 20 to 656 fathoms. It is found as a fossil in Norway, England, the north of Russia, Siberia and North America.

**Portlandia intermedia, M. Sars.**

*Yoldia intermedia*, M. Sars, Foss. Dyrelevninger, 1865, p. 38, tab. 3, fig. 92—96.

*Portlandia* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 38, Pl. 3, fig. 9 a—b.

*Leda* — Leche, Kongl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 24, Pl. 1, fig. 5.

**Findested.** Stationerne 224, 225, 260, 261, 262, 273, 312, 323, 326 og 357. Dybde 95—658 fv.

Den er en circumpolar art, der er kjendt fra Grønland, Spitsbergen, Shetlandsøerne, Murmankysten, Novaja Semlja, Karahavet og Beringshavet. Desuden er den tagen udenfor kysten af Portugal, antagelig er den dog her blot subfossil. Ved de norske kyster var den tidligere kun kjendt fra Varangerfjorden, hvor den fandtes først af M. Sars og senere af G. O. Sars. Den bathymetriske udbredelse er 25—220 fv. (levende). De paa station 312—658 fv. fundne exemplarer var døde. Jeffreys angivelse af 1333 fv. maa bero paa en misforstaaelse. Fossil er den kjendt fra Norge og det nordlige Rusland.

**Locality.** Stations 224, 225, 260, 261, 262, 273, 312, 323, 326, and 357. Depth 95—658 fathoms.

It is a circumpolar species, previously found off Greenland, Spitsbergen, the Shetland Isles, the Murman Coast, Novaja Semlja, and in the Kara and Bering Seas. It has also been found off the coast of Portugal, although probably only sub-fossil there. In Norway, it was formerly only known in the Varanger Fjord, where it was first detected by M. Sars, and subsequently by G. O. Sars. Its bathymetrical distribution is from 25—220 fathoms (living). The specimens from Station 312 (658 fathoms) were dead. Jeffreys reports it from 1333 fathoms, but this is no doubt due to a misapprehension. It is known as a fossil in Norway and the north of Russia.

**Portlandia lucida, Lovén.**

*Yoldia lucida*, Lovén, Ind. Moll. Scand., 1846, p. 46.

— — M. Sars, Foss. Dyrelevninger, 1865, p. 38, Pl. 3, figs. 87—91.

*Leda* — Jeffreys, Brit. Conch., vol. 5, 1869, p. 173, Pl. 100, fig. 1.

*Portlandia lucida*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 37, Pl. 4, fig. 8 a—b.

**Findested.** Stationerne 10, 18, 101, 252, 253, 255, 257, 260, 261, 262, 326, 338, 357 og Sognefjord, 100 fv. Dybde 100—412.

*Portlandia lucida* er almindelig langs hele den norske kyst paa dyb over 20 fv. Den er endvidere kjendt fra Middelhavet, Kattegat, Skagerak og det nordlige af Atlanterhavet med tilstødende dele af Ishavet; artens nordgrænse er ved Spitsbergen, sydgrænsen ved Gibraltar. Paa den amerikanske side gaar den fra Melville Bay i nord, til Massachusetts i syd. Den bathymetriske udbredelse er 10—1456 fv. Fossil er den funden i Norge og England.

**Locality.** Stations 10, 18, 101, 252, 253, 255, 257, 260, 261, 262, 326, 338, and 357, and the Sogne Fjord (100 fathoms). Depth 100—412 fathoms.

*Portlandia lucida* is common all along the Norwegian coast in depths of more than 20 fathoms. It has also been found in the Mediterranean, the Kattegat, the Skagerak, and the northern part of the Atlantic with the adjoining portions of the Arctic Ocean. The northern limit of the species is at Spitsbergen, its southern at Gibraltar. On the American side, it ranges from Melville Bay in the north to Massachusetts in the south. Its bathymetrical distribution is from 10 to 1456 fathoms. It is found as a fossil in Norway and England.

**Portlandia expansa, Jeffreys.**

*Leda expansa*, Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 18, 1876, p. 431.

— — Jeffreys, Proc. Zool. Soc., 1879, p. 580, Pl. 46, fig. 4.

*Portlandia expansa* foreligger kun i nogle faa exemplarer fra stat. 290, 191 fv. og stat. 363, 260 fv. Arten er tidligere kjendt fra munden af Baffinsbugten, kysten af New Foundland, oceandynet sydost af Grønland, Irlands nordvestkyst, Biskayerbugten og mellem Gibraltar og Azorerne. Den bathymetriske udbredelse er 191—1750 fv.

There are only a few specimens of *Portlandia expansa* from stations 290 (191 fathoms), and 363 (260 fathoms). The species had previously been found at the mouth of Baffin's Bay, off the coast of Newfoundland, in the deep water to the south-east of Greenland, off the north-west coast of Ireland, in the Bay of Biscay, and between Gibraltar and the Azores. Its bathymetrical distribution is from 191 to 1750 fathoms.

**Leda pernula, Müller.**

*Arca pernula*, Müller, Beschäft. Berliner Gesellsch. naturforsch. Freunde, vol. 4, 1779, p. 57.

*Leda* — Lovén, Ind. Moll. Scand., 1846, p. 34.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 35, Pl. 5, fig. 1 a—d.

— — Verrill & Bush, Proc. U. S. Nat. Museum, vol. 20, 1898, p. 855, Pl. 82, fig. 2.

**Findested.** Stationerne 224, 261, 267, 270, 323, 336, 357, Saltenfjord, 20 fv., Advent Bay, 20—40 fv., Magdalena Bay, 30—60 fv. Dybde 20—223 fv.

Denne variable art, som er jevnt udbredt langs hele den norske kyst, er kjendt fra saavel det pacifikarktiske som det atlantikarktiske omraade. Inden sidstnævnte har den sin sydgrænse ved Maine og Biskayerbugten. Den bathymetriske udbredelse er 4—517 fv. Fossil er den funden i Skandinavien, De britiske øer, Nord Rusland, Spitsbergen, Sibirien, Nordamerika og Grønland.

**Locality.** Stations 224, 261, 267, 270, 323, 336, and 357, Salten Fjord (20 fathoms), Advent Bay (20—40 fathoms), Magdalena Bay (30—60 fathoms). Depth 20—223 fathoms.

This variable species, which is evenly distributed all along the Norwegian coast, is found in both Pacific-Arctic, and Atlantic-Arctic regions. Its southern limit on the Atlantic side is at Maine and the Bay of Biscay. The bathymetrical range is from 4 to 517 fathoms. It is found as a fossil in Scandinavia, the British Isles, northern Russia, Spitsbergen, Siberia, North America, and Greenland.



**Leda minuta**, O. F. Müller.

*Arca minuta*, O. F. Müller, Prodr. Zool. Dan., 1776, p. 247.

— — — Fabricius, Fauna Grønlandica, 1780, p. 414.

*Leda caudata*, Lovén, Ind. Moll. Scand., 1846, p. 34.

— *minuta*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 155, vol. 5, p. 173, Pl. 4, fig. 2, Pl. 29, fig. 6.

— — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 36, Pl. 5, fig. 2 a—b.

— *caudata*, Verril & Bush, Proc. U. S., Nat. Museum, vol. 20, 1898, p. 855, Pl. 82, fig. 1.

Fragmenter af denne art foreligger fra stat. 257, 160 fv. Desuden toges den ved stat. 223, 70 fv. Hammerfest og Alten.

*Leda minuta* har den samme udbredelse som foregaaende art, dog gaar den inden Pacifikomraadet helt syd til Oregon og Japan. Ved Atlanterhavskysterne har den sin sydgrænse ved Fundy Bay, De britiske øer og Bælterne. Den bathymetriske udbredelse er 2—200 fv. Fossil er den funden i Skandinavien, nordlige Rusland, De britiske øer og Nordamerika.

There are fragments of this species from Station 257 (160 fathoms). It was also found at Station 223 (70 fathoms), Hammerfest, and Alten.

*Leda minuta* has the same distribution as the foregoing species, but in the Pacific it is found as far south as Oregon and Japan. Its southern limit off the shores of the Atlantic is at Fundy Bay, the British Isles, and the Great and Little Belts. Its bathymetrical distribution is from 2 to 200 fathoms. It is found in the fossil state in Scandinavia, the north of Russia, the British Isles, and North America.

**Nucula tenuis**, Montagu.

*Arca tenuis*, Montagu, Test. Brit. Suppl., 1808, p. 56, Pl. 29, fig. 1.

*Nucula tenuis*, Møller, Ind. Moll. Grøn., 1842, p. 17.

— — — Jeffreys, Brit. Conch., vol. 2, 1863, p. 151, Pl. 29, fig. 4.

— — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 33, Pl. 4, fig. 6 a—b.

**Findested.** Stationerne 267, 326, 336, 357; Rognan, Salten, 20 fv. Magdalena Bay, Advent Bay og Norskøerne, 20—60 fv. Dybde 20—148 fv.

*Nucula tenuis*, som er almindelig langs hele den norske kyst, er en circumpolar art, der er kjendt fra Middelhavet, Europas vest- og nordkyst, Spitsbergen, Barentshavet, Karahavet, Sibiriens ishavskyster, Beringshavet, Kamtschatka, Japan, Vancouver, Amerikas nord- og østkyst indtil Cape Hatteras og Grønland. Den bathymetriske udbredelse er 3—1230 fv. Fossil er den kjendt fra Skandinavien, nordlige Rusland, Spitsbergen, Sibirien, Nordamerika, Italien og De britiske øer.

**Locality.** Stations 267, 326, 336, and 357, Rognan, Salten (20 fathoms), Magdalena Bay, Advent Bay, and the Norwegian Islands (20—60 fathoms). Depth 20—148 fathoms.

*Nucula tenuis*, which is common all along the Norwegian coast, is a circumpolar species that is known in the Mediterranean, off the west and north coasts of Europe, Spitsbergen, in the Barents Sea, the Kara Sea, off the Arctic coast of Siberia, in the Bering Sea, Kamtschatka, Japan, Vancouver's Isle, off the north coast of North America and the east coast as far south as Cape Hatteras, and in Greenland. Its bathymetrical distribution is from 3 to 1230 fathoms. It is found as a fossil in Scandinavia, northern Russia, Spitsbergen, Siberia, North America, Italy, and the British Isles.

**Nucula tumidula**, Malm.

*Nucula tumidula*, Malm, Forhandl. Skand. Naturforsk. 8de møde, 1860, p. 621.

— — — Malm, Goth. K. Vet. Vit. Samh. Ny Tidsskr., vol. 8, 1863, p. 122, Pl. 2, fig. 3.

— — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 33, Pl. 4, fig. 5 a—c.

**Findested.** Stationerne 1, 79, 253, 255, 267 og Sognefjord, 100 fv. Dybde 100—650 fv.

**Locality.** Stations 1, 79, 253, 255, and 267, and the Sogne Fjord (100 fathoms). Depth 100—650 fathoms.

Denne art, som først opdagedes af intendant Malm ved Bohuslän, er udbredt langs hele Vesteuropa fra Finmarken til kysten af Maroco samt Middelhavet. Den bathymetriske udbredelse er 20—1456 fv. Fossil er *nucula tumidula* kun kjendt fra Italien.

This species, which was first discovered in Bohuslän, by Intendant Malm, ranges from Finmark to the coast of Morocco, and is also found in the Mediterranean. Its bathymetrical distribution is from 20 to 1456 fathoms. *Nucula tumidula*, as a fossil, is only known in Italy.

#### ***Nucula delphinodonta*, Mighels & Adams.**

*Nucula delphinodonta*, Mighels & Adams, Proc. Boston Soc., vol. 1, 1841, p. 48.

— Mighels & Adams, Boston Journ. Nat. Hist., vol. 4, 1842, p. 40, p. 324, Pl. 4, fig. 5.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 34, Pl. 4, fig. 4 a—c.

**Findested.** Stationerne 192, 261, 262 og 267. Dybde 127—649 fv.

*Nucula delphinodonta* er en nordatlantisk art, som er kjendt fra Grønland, Nordamerikas østkyst indtil New Jersey, Færokanalen, Murmankysten og den norske kyst, hvor den forekommer ved Lofoten, Tromsø og Finmarken samt i Kristianiafjorden. Ved vor syd- og vestkyst er den derimod mærkelig nok endnu ikke funden. Den bathymetriske udbredelse er 6—649 fv. Fossil er *nucula delphinodonta* blot kjendt fra Sicilien.

**Locality.** Stations 192, 261, 262 and 267. Depth 127—649 fathoms.

*Nucula delphinodonta* is a North Atlantic species, known in Greenland, on the east coast of North America down to New Jersey, in the Faroe Channel, off the Murman Coast, and the Norwegian coast, where it occurs in Lofoten, Tromsø, Finmark and the Christiania Fjord. Strange to say, it has not yet been found on the south and west coasts of Norway. Its bathymetrical distribution is from 6 to 649 fathoms. *Nucula delphinodonta* is known as a fossil only in Sicily.

#### ***Arca nodulosa*, O. F. Müller.**

*Arca nodulosa*, O. F. Müller, Zool. Dan. Prodr., 1766, p. 247.

— — Jeffreys, Brit. Conch., vol. 2 1863, p. 180, vol. 5, p. 176, Pl. 100, fig. 2

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 42, Pl. 4, fig. 3.

*Arca nodulosa* erholdtes kun ved Husø, 40—60 fv., samt i nogle døde exemplarer paa stat. 173 b, 300 fv. og stat. 255, 341.

Den er udbredt langs vor syd- og vestkyst op til Lofoten. Forøvrigt forekommer den i Middelhavet og fra Færoerne til Kanariske øer, Azorerne og Nordafrikas vestkyst. Desuden anfører Jeffreys den fra Den mexikanske golf og Dall fra Florida. Den bathymetriske udbredelse er 15—2114 fv. Fossil er den funden i Norge, Frankrig og Italien.

*Arca nodulosa* was found only at Husø (40—60 fathoms), a few dead specimens being found at Stations 173 b (300 fathoms) and 255 (341 fathoms).

It is distributed along the south coast of Norway, and along the west coast up to Lofoten. It further occurs in the Mediterranean, and from the Faroe Isles to the Canaries, the Azores, and the north-west coast of Africa. Jeffreys also states its occurrence in the Gulf of Mexico, and Dall in Florida. Its bathymetrical distribution is from 15 to 2114 fathoms. It is found as a fossil in Norway, France and Italy.

#### ***Arca glacialis*, Gray.**

*Arca glacialis*, Gray, Parry's first Voyage, Suppl. to App., 1824, p. 244.

— Torell, Spitsbergens Moll., 1859, p. 153, Pl. 2, fig. 7 a—c.

— *varidentata*, var. *major*, M. Sars, Foss. Dyrelevninger, 1865, p. 35, Pl. 2, fig. 29 31 (partim).

— *glacialis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 43, Pl. 4, fig. 1 a—c.

— — Leche, Kongl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 29, Pl. 1, fig. 8.

**Findested.** Stationerne 223, 224, 225, 260, 267, 270, 273, 290, 357 og 363. Dybde 70—260 fv.

I Norge forekommer *arca glacialis* fortiden blot levende ved Finmarkens kyster. Arten er fremdeles kjendt

**Locality.** Stations 223, 224, 225, 260, 267, 270, 273, 290, 357, and 363. Depth 70—260 fathoms.

*Arca glacialis*, in Norway, occurs at present, in the living state, only off the coast of Finmark. The species is

fra Amerikas nord- og østkyst indtil New England, Grønland, Island, Spitsbergen, Murmankysten, Barentshavet, Novaja Semlja, Karahavet og videre østover indtil Chatangabugten. Den bathymetriske udbredelse er 30—1456 fv. Fossil er *arca glacialis* kendt fra Grønland, Nordamerika, Shetlandsøerne, Skandinavien, nordlige Rusland og Sicilien.

also found off the north coast of North America, and the east coast down to New England, in Greenland, Iceland, Spitsbergen, on the Murman Coast, in the Barents Sea, Novaja Semlja, the Kara Sea, and eastwards as far as Chatanga Bay. Its bathymetrical distribution is from 30 to 1456 fathoms. *Arca glacialis* is found as a fossil in Greenland, North America, Shetland Isles, Scandinavia, the north of Russia, and Sicily.

### *Arca frielei*, Jeffreys.

*Arca frielei*, Jeffreys, m. s. Friele, Nyt Mag. f. Naturvidensk., vol. 23, 1877, p. 2.

— — Jeffreys, Proc. Zool. Soc., 1879, p. 573, Pl. 45, fig. 4, 4 a.

— — Friele, Jahrb. Deut. Mal. Gesell., vol. 6, 1879, p. 266, Pl. 4, fig. 9.

— *imitata*, Smith, Rep. Sci. Res. Challenger Exp. Zool., vol. 13, part. 35, 1885, p. 321.

*Arca frielei* kan ikke saasom af Verrill<sup>1)</sup> og Kobelt<sup>2)</sup> betragtes som en varietet af *arca pectunculoides*, thi fra denne art og dens varieteter udmærker den sig ved sin tilspidsede stærkt triangulære form. Hos *arca frielei* er endvidere de fra umbonerne udgaaende ribber mere fremtrædende og mindre talrige. Skallets vel udviklede haarbeklædning er endvidere af en grovere struktur end hos *arca pectunculoides*. Verrill synes ganske at have misopfattet denne art; vi tør ikke med bestemthed paastaa, at det er *arca pectunculoides* han har afbildet, men under ingen omstændigheder er det formen *frielei*. Uoverensstemmelsen mellem Verrill's og Jeffreys's tegninger har forøvrigt ogsaa Locard<sup>3)</sup> været opmærksom paa; han bemærker med rette, at han har vanskelig for at identificere dem.

Under navnet *arca imitata* beskriver og afbilder E. A. Smith en bivalv, som „Challenger“ erholdt i den nordlige del af Det stille ocean (station 244, 2900 fv.). Denne art har den samme form, den samme striering af skallet o. s. v. som *arca frielei*, og baade beskrivelse og tegning passer paa denne, hvorfor vi maa anse dem for identiske.

**Findested.** Stationerne 40, 51, 53, 248, 283, 295, 303, 312 og 353. Dybde 658—1539 fv.

Arten er tidligere funden af „Porcupine“ i Færøkanalen (1869, stat. 65, 345 fv.). „Caudan“ har den fra Biskayerbugten, 239 fv., „Hirondelle“ og „Princesse Alice“ fra Azorerne (691—851 fv.), „Travailleur“ fra kysten af Senegambien, 55 fv., og „Challenger“ fra Det stille ocean. Denne sidste localitet synes at tyde paa, at denne dybvandsart har en kosmopolitisk udbredelse. Den bathymetriske udbredelse er 55—2900 fv.

It is impossible to regard *Arca frielei*, as Verrill<sup>1)</sup> and Kobelt<sup>2)</sup> have done, as a variety of *Arca pectunculoides*, for it differs from that species and its varieties in its pointed, very triangular shape. In *Arca frielei*, moreover, the ribs issuing from the umbones are more prominent and less numerous. Further, the well-developed hairy covering of the shell is of a coarser structure than in *A. pectunculoides*. Verrill seems to have altogether misunderstood this species. We would not venture to assert that it is *A. pectunculoides* that he has figured, but at any rate it is not *A. frielei*. Locard<sup>3)</sup> has also noticed the difference between Verrill's and Jeffreys's drawings. He justly remarks that he has a difficulty in identifying them.

E. A. Smith describes and figures under the name of *Arca imitata*, a bivalve found by the 'Challenger' in the northern part of the Pacific (Station 244; 2900 fathoms). This species has the same shape, the same striation of the valve, etc. as *A. frielei*, which answers in every way both to the description and the drawing. We may therefore regard them as identical.

**Locality.** Stations 40, 51, 53, 248, 283, 295, 303, 312, and 353. Depth 658—1539 fathoms.

The species has been found by the 'Porcupine' in the Faroe Channel (1869, Station 65; 345 fathoms), the 'Caudan' in the Bay of Biscay (239 fathoms), the 'Hirondelle' and the 'Princess Alice' in the Azores (691—851 fathoms), the 'Travailleur' off the coast of Senegambia (55 fathoms), and the 'Challenger' in the Pacific. The last-named locality seems to indicate that this deep-water species has a cosmopolitan distribution. Its bathymetrical distribution is from 55 to 2900 fathoms.

<sup>1)</sup> Trans. Connecticut Acad., vol. 5, 1882, p. 574, tab. 44, fig. 5, 6.

<sup>2)</sup> Mart. Chemn. Conch. Cab., vol. 8, part 2, 1891, p. 213.

<sup>3)</sup> Moll. Test. Exp. Sci., „Travailleur“ & „Talisman“, vol. 2, 1898, p. 320.

<sup>1)</sup> Trans. Connecticut Acad. Vol. 5, 1882, p. 574, Pl. XLIV, figs. 5, 6.

<sup>2)</sup> Mart. Chemn. Conch. Cab. Vol. 8, part 2, 1891, p. 213.

<sup>3)</sup> Moll. Test. Exp. Sci. 'Travailleur' & 'Talisman'. Vol. II, 1898, p. 320.



**Arca pectunculoides, Scacchi.**

*Arca pectunculoides*, Scacchi, Ann. civ. dell. Sicil., vol. 6, 1836, p. 82.

— *varidentata*, Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 241, Pl. 45, fig. 8.

— *pectunculoides*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 171, Pl. 30, fig. 3.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 43.

Hovedformen fandtes ved Husø, 40—100 fv., og ved stationerne 9, 10, 18 og 79. Dybde 40—412 fv. Den større arktiske form *septentrionalis* foreligger fra stationerne: 87, 164, 173 b, 192, 225, 237, 251, 260, 261, 262, 273, 283, 290, 312, 323, 336, 338 og 363. Dybde 70—767 fv.

Ved vor syd- og vestkyst op til Lofoten er hovedformen meget almindelig. Ved Tromsø og Finmarken erstattes den af varieteten *septentrionalis*. *Arca pectunculoides* er udbredt i den nordlige del af Atlanterhavet og tilstødende dele af Ishavet fra Grønland til Vestindien og Den mexikanske golf og fra Spitsbergen og Novaja Semlja til Middelhavet og Marocos vestkyst, samt fra Davisstrædet til øst for Taimurhalvøen (116° Ø. L.). Den bathymetriske udbredelse er 5—1568 fv. Fossil er den funden i Norge, England, Belgien, Frankrig, Italien, Rhodes og muligens ved floden Indiga i det nordlige Rusland (Knipowitsch).

I „Nyt Magazin for Naturvidenskaberne“ (vol. 11, 1859, p. 21) har Danielssen beskrevet en *arca koreni*, som af Jeffreys henføres til *arca glacialis*, Gray<sup>1)</sup>. Kobelt oprettholder den derimod i sin monografi over slægten *arca* som en egen art, *arca (bathyarca) koreni*. Vi har haft anledning til at undersøge Danielsens typeexemplarer, der opbevares i Bergens museum. De viste sig at være typiske *arca pectunculoides*, var. *septentrionalis*. *Arca koreni* maa derfor udgaa af systemet.

The principal form was found at Husø (40—100 fathoms), and at Stations 9, 10, 18 and 79. Depth 40—412 fathoms. The larger, arctic form, *septentrionalis*, was found at Stations 87, 164, 173, 192, 225, 237, 251, 260, 261, 262, 273, 283, 290, 312, 323, 336, 338 and 363. Depth 70—767 fathoms.

Off the south and west coasts of Norway, up to Lofoten, the principal form is very common. In Tromsø and Finmark, it is replaced by the variety *septentrionalis*. *Arca pectunculoides* is distributed throughout the northern part of the Atlantic, and the adjoining parts of the Arctic Ocean, from Greenland to the West Indies and the Gulf of Mexico, from Spitsbergen and Novaja Semlja to the Mediterranean and the west coast of Morocco, and from Davis Straits to the east of the Taimur Peninsula (116° E. Long.). Its bathymetrical distribution is from 5 to 1568 fathoms. It is found as a fossil in Norway, England, Belgium, France, Italy, Rhodes, and possibly in the river Indiga in northern Russia (Knipowitsch).

In „Nyt Magazin for Naturvidenskaberne“ (Vol. II, 1859, p. 21), Danielssen has described an *Arca Koreni*, that is referred by Jeffreys to *Arca glacialis*, Gray<sup>1)</sup>. Kobelt, on the other hand, in his monograph on the genus *Arca*, maintains that it is a separate species, *Arca (Bathyarca) Koreni*. We have had an opportunity of examining Danielssen's type specimens, which are in the Bergen Museum. They proved to be typical *Arca pectunculoides* var. *septentrionalis*. *Arca Koreni* must therefore be omitted from the system.

**Limopsis minuta, Philippi.**

*Pectunculus minutus*, Philippi, Enum. Moll. Sicil, vol. 1, 1836, p. 63, Pl. 5, fig. 3.

*Limopsis borealis*, Woodward, m. s., Jeffreys, Brit. Conch., vol. 5, 1869, p. 174, Pl. 133, fig. 3.

— *minuta*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 44, Pl. 3, fig. 5 a—c.

— — Jeffreys, Proc. Zool. Soc., 1879, p. 585, Pl. 46, fig. 9.

— Locard, Moll. Test. Exp. Sci. „Travailleur“ & „Talisman“, vol. 2, 1898, p. 328, Pl. 14, fig. 30—32.

**Findested.** Stationerne 8 (et halvt skal), 9, 79, 124, 149, 173 b, 192 (døde skaller), 195, 255, 260, 262 og 290. Dybde 107—350 fv. (649 fv.).

*Limopsis minuta*, der forekommer sparsomt langs vor vestkyst op til Finmarken, er langs Atlanterhavets østkyst

**Locality.** Stations 8 (half a shell), 9, 79, 124, 149, 173 b, 192 (empty shells), 195, 255, 260, 262 and 290. Depth 107—350 fathoms (649 fathoms).

*Limopsis minuta*, which is scarce along the west coast of Norway up to Finmark, has been found at a

<sup>1)</sup> Ann. & Mag. Nat. Hist., ser. 4, vol. 20, 1877, p. 233.

<sup>1)</sup> Ann. & Mag. Nat. Hist. ser. IV, Vol. XX, p. 233.

kjendt fra en række stationer helt syd til Kap det gode haab og fra Middelhavet. Paa Den amerikanske side er den funden ved New England, Vestindien og Den mexikanske golf. Den bathymetriske udbredelse er 70—1060 fv. Fossil er den funden i Tyskland og Italien.

number of stations along the eastern shores of the Atlantic as far south as the Cape of Good Hope, and in the Mediterranean. It is found on the American side in New England, the West Indies, and the Gulf of Mexico. Its bathymetrical distribution is from 70 to 1060 fathoms. It is found as a fossil in Germany and Italy.

#### **Modiola phaseolina, Philippi.**

*Modiola phaseolina*, Philippi, Enum., Moll. Sic., vol. 2, 1844, p. 51, Pl. 15, fig. 14.

— — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 186, Pl. 44, fig. 3.

*Mytilus phaseolinus*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 171, Pl. 27, fig. 5.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 28.

**Findested.** Stationerne 9, 149, 173 b og 192 (døde skaller). Dybde 135—300 fv. (649 fv.).

Denne art forekommer almindelig paa de større dyb langs hele vor kyst og er udbredt fra Finmarken til Middelhavet. Den bathymetriske udbredelse er 0—3000 fv. Fossil er den funden i Norge, Belgien, Italien og Rhodes.

**Locality.** Stations 9, 149, 173 b and 192 (empty shells). Depth 135—300 fathoms (649 fathoms).

This species is of common occurrence in the deep water all along the Norwegian coast, and is distributed from Finmark to the Mediterranean. Its bathymetrical distribution is from 0 to 3000 fathoms. It is found as a fossil in Norway, Belgium, Italy, and Rhodes.

#### **Modiolaria marmorata, Forbes.**

*Mytilus marmoratus*, Forbes, Malac. Monensis, 1838, p. 44.

*Crenella marmorata*, Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 198, Pl. 45, fig. 4.

*Modiolaria marmorata*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 122, Pl. 28, fig. 1.

— — Meyer & Möbius, Fau. d. Kielerbucht, vol. 2, 1872, p. 83, fig. 10—13.

Denne art fandtes kun ved Husø, 40 fv. Den er udbredt langs vor syd- og vestkyst op til Trondhjemsfjorden, hvor Norman har fundet den i kappen hos *Ciona intestinalis*. Locard anfører desuden, at baron Jules de Guerne har den fra Varangerfjorden, men maa dette bero paa en forvexling. Den findes idetmindste ikke optagen i de Guernes katalog over Varangerfjordens mollusker<sup>1)</sup>, heller ikke har vi fundet den omtalt i andre arbejder over det nordlige Norges mollusker. *Modiolaria marmorata* er udbredt fra det vestlige Norge og Færøerne til Middelhavet og Kanariske øer. Jeffreys anfører den desuden fra Den persiske bugt og det nordlige af Det stille ocean. Den bathymetriske udbredelse er 10—579 fv. Fossil er den funden i Belgien, England og Italien.

This species was found only at Husø (40 fathoms). It is distributed along the south coast of Norway, and the west coast up to the Trondhjem Fjord, where Norman found it in the mantle of a *Ciona intestinalis*. Locard also states that Baron Jules de Guerne found it in the Varanger Fjord, but this must be a mistake. It is not, at any rate, mentioned in De Guerne's catalogue of the Mollusca of the Varanger Fjord<sup>1)</sup>, nor have we found it mentioned from northern Norway by any other authors. *Modiolaria marmorata* is distributed from Trondhjem and the Faroe Isles, to the Mediterranean and the Canaries. Jeffreys also states its occurrence in the Persian Gulf and the North Pacific. Its bathymetrical distribution is from 10 to 579 fathoms. It is found as a fossil in Belgium, England, and Italy.

<sup>1)</sup> Notes sur l'histoire naturelle des régions arctiques de l'Europe; le Varangerfjord. Bull. Soc. Roy. Malac. de Belgique, vol. 21, 1886.

<sup>1)</sup> Notes sur l'histoire naturelle des régions arctiques de l'Europe; le Varanger Fjord. Bull. Soc. Roy. Malac. de Belgique. Vol. XXI, 1886.

**Modiolaria lævigata, Gray.**

*Modiolaria lævigata*, Gray, Parry's first Voyage, Suppl. App., 1824, p. 24 og 245.

- *discors*, Middendorf, Beitr. Malacozool., Rossica, vol. 3, 1849, p. 15, Pl. 12, figs. 11—12.
- *lævis*, Beck, Voy. de la Recherche, 1851, Pl. 17, fig. 3 a—f.
- *discors*, Gould & Binney, Rep. on Invert. of Mass., 1870, p. 192
- *lævigata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 29, Pl. 3, fig. 3 a—b.

**Findested.** Stationerne 322 og 336 samt Norskøerne, 10—20 fv., Advent Bay, 40—60 fv., Magdalena Bay, 30—60 fv., Beeren Eiland og Hammerfest, 20 fv. Dybde 10—70 fv.

*Modiolaria lævigata* er en circumpolar art, som forekommer ved Grønland, Nordamerikas nord- og østkyst indtil Massachusetts, Nordeuropa, Spitsbergen, Jan Mayen, Barentshavet, Novaja Semlja, Karahavet, Sibiriens ishavskyster, Beringshavet, Okotske hav og Japan. Ved de norske kyster er den ikke funden søndenfor Lofoten. Den bathymetriske udbredelse er 0—175 fv. Fossil er den funden paa Spitsbergen, Skandinavien, Britiske øer og Nordamerika.

**Locality.** Stations 322 and 336, the Norwegian Islands (10—20 fathoms), Advent Bay (40—60 fathoms), Magdalena Bay (30—60 fathoms), Bear Island and Hammerfest (20 fathoms). Depth 10—70 fathoms

*Modiolaria lævigata* is a circumpolar species, occurring in Greenland, off the north coast of North America and the east coast down to Massachusetts, off Northern Europe, Spitsbergen, Jan Mayen, in the Barents Sea, Novaja Semlja, the Kara Sea, off the Siberian shores of the Arctic Ocean, in the Bering Sea, the Sea of Okhotsk, and Japan. It is not found off the Norwegian coasts south of Lofoten. Its bathymetrical distribution is from 0 to 175 fathoms. As a fossil it occurs in Spitsbergen, Scandinavia, the British Isles, and North America.

**Modiolaria discors, Linné.**

*Mytilus discors* Linné, Syst. Nat. ed. 12, 1766, p. 1159.

*Modiolaria* — Lovén, Ind. Moll. Scand., 1846, p. 33.

*Crenella* — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 195, Pl. 45, figs. 5, 6, Pl. 48, fig. 5

*Modiolaria* — Jeffreys, Brit. Conch., vol. 2, 1863, p. 126, vol. 5, p. 171, Pl. 28, fig. 3.

— G. O. Sars, Moll. Reg. Arct. Norv., p. 29.

Denne art fandtes ved Husø og Tromsø paa grundtvand. Den er som *modiolaria lævigata* en circumpolar art; men da den imidlertid oftere synes at være sammenblandet med denne, kan dens udbredelsesomraade ikke med sikkerhed angives, dog synes den ikke at gaa saa langt mod nord som *modiolaria lævigata*. Den er almindelig i littoral og sublittoral bæltet langs hele den norske kyst.

This species was found at Husø and Tromsø in shallow water. Like *M. lævigata*, it is a circumpolar species; but as it seems to be often confounded with that species, its field of distribution cannot be given with any certainty, although it does not appear to reach as far north as *M. lævigata*. It is common in the littoral and sub-littoral belts all round the Norwegian coast.

**Crenella decussata, Montagu.**

*Mytilus decussatus*, Montagu, Test. Brit. Suppl., 1808, p. 69.

*Crenella decussata*, Middendorf, Beitr. Malacozool. Rossica, vol. 3, 1849, p. 14, Pl. 11, figs. 22—24.

— — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 210, Pl. 45, fig. 2.

— — Jeffreys, Brit. Conch., vol. 2, 1863, p. 133, vol. 5, p. 172, Pl. 3, fig. 4, Pl. 28, fig. 6.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 31, Pl. 3, fig. 4 a—b.

*Crenella decussata* fandtes paa stat. 260 og 261, 127 fv. samt ved Hammerfest og Alten. Den er en circumpolar art, som inden det atlantis-arktiske omraade er udbredt fra Spitsbergen og Novaja Semlja til Middelhavet og fra Grønland og arktisk Nordamerika til Den mexicanske golf og Vestindien. Inden det pacifik-arktiske omraade har den sin sydgrænse ved Japan og Kalifornien. Ved vor

*Crenella decussata* was found at Stations 260 and 261 (127 fathoms), and at Hammerfest and Alten. It is a circumpolar species, which, in the Atlantic-Arctic region, is distributed from Spitsbergen and Novaja Semlja to the Mediterranean, and from Greenland and arctic North America to the Gulf of Mexico and the West Indies. In the Pacific-Arctic region, its southern limit is at Japan



sydkyst mangler denne art, selv ved vestkysten er den temmelig sjelden. Først i det nordlige Norge og da særlig i Finmarken optræder den talrig. Den bathymetriske udbredelse er 0—1750 fv. Fossil er den funden i Norge, nordlige Rusland, Skotland og Sicilien.

and California. This species is not found on the south coast of Norway, and even on the west coast it is rather rare. It is only in the north, and especially in Finmark, that it becomes numerous. Its bathymetrical distribution is from 0 to 1750 fathoms. It is found as a fossil in Norway, northern Russia, Scotland, and Sicily.

#### **Dacrydium vitreum, Holboll.**

*Modiola(?) vitrea*, Holboll, Møller, Ind. Moll. Grønl., 1842, p. 19.

*Dacrydium vitreum*, Torell, Spitsbergens Moll., 1859, p. 139, tab. 1, fig. 2 a—b.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 28, tab. 3, fig. 2 a—b.

— — Verrill, Trans. Connecticut Acad., vol. 5, 1882, p. 579, tab. 44, fig. 8.

**Findested.** Stationerne 10, 31, 40, 48, 124, 164, 173 b, 192, 195, 223, 224, 260, 261, 262, 267, 270, 290, 323, 326, 338, 357, 363 samt Hammerfest, 20 fv. Dybde 20—1215 fv.

*Dacrydium vitreum* er en nordatlantisk art, som er udbredt fra Karahavet og Spitsbergen til Middelhavet og Azorerne og fra Grønland til Campechebugten, U. S. A. Den er ikke funden i Christianiafjorden eller ved vor sydkyst, derimod synes den at være ret almindelig ved vor øvrige kyst. Den bathymetriske udbredelse er 20—2435 fv. Fossil er den funden i det nordlige Rusland, England, Tyskland og Italien.

**Locality.** Stations 10, 31, 40, 48, 124, 164, 173 b, 192, 195, 223, 224, 260, 261, 262, 267, 270, 290, 323, 326, 338, 357, and 363, and Hammerfest (20 fathoms). Depth 20—1215 fathoms.

*Dacrydium vitreum* is a North Atlantic species, ranging from the Kara Sea and Spitsbergen to the Mediterranean and the Azores, and from Greenland to Campeche Bay. It does not occur in the Christiania Fjord nor off the south coast of Norway; but at other parts of the coast it seems to be rather common. Its bathymetrical distribution is from 20 to 2435 fathoms. It is found as a fossil in northern Russia, England, Germany, and Italy.

#### **Astarte borealis, Chemnitz.**

*Venus borealis*, Chemnitz, Conch. Cab., vol. 7, 1784, p. 26, tab. 39, figs. 412, 413.

*Crassina borealis*, Nilsson, Nov. Act. Holm. 1822, p. 188, tab. 2, fig. 3, 4.

*Astarte corrugata*, Lovén, Ind. Moll. Scand., 1846, p. 37.

— *arctica*, Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 161, Pl. 30, fig. 7.

— *borealis*, Meyer & Möbius, Fauna v. Kieler Bucht, vol. 2, 1872, p. 95, figs. 1—4.

*Tridonta borealis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 50, Pl. 5, fig. 8 a—b.

*Astarte borealis* fandtes ved Jan Mayen, 10—15 fv., Advent Bay og Magdalena Bay, 20—40 fv., endvidere ved stationerne 280, 322 og 363. Dybde 70—260 fv. Exemplarerne fra Advent Bay, Magdalena Bay og stat. 363 tilhører formen *placenta*, Mörch.

Fra station 312, 658 fv., og station 353, 1333 fv., foreligger fragmenter, som antagelig af isen er ført ud paa dybet. Det samme gjælder formodentlig ogsaa om de eksemplarer, som ifølge Jeffreys erholdtes af Valorousexpeditionen paa 1450 favnes dyb.

*Astarte borealis* er en circumpolar art, som har sin sydgrænse ved Bornholm, Kiel, kysten af New England og Alaska. Ved den norske kyst er den ikke funden sønder for Bergen. Den bathymetriske udbredelse er 2—260 fv. Den er fossil i Skandinavien, Britiske øer, Island, nordlige Rusland, Spitsbergen, Sibirien, Nordamerika og Grønland.

*Astarte borealis* was found in Jan Mayen (10—15 fathoms), Advent and Magdalena Bays (20—40 fathoms), and at Stations 280, 322, and 363. Depth 70—260 fathoms. The specimens from Advent Bay, Magdalena Bay, and Station 363 belong to the form *placenta*, Mörch.

There are some fragments from Station 312 (658 fathoms) and Station 353 (1333 fathoms), which have no doubt been carried out into deep water by the ice. This was probably also the case with the specimens which, according to Jeffreys, were taken by the Valorous Expedition from a depth of 1450 fathoms.

*Astarte borealis* is a circumpolar species, with its southern limit at Bornholm, Kiel, the coast of New England, and Alaska. Off the Norwegian coast, it does not range farther south than Bergen. Its bathymetrical distribution is from 2 to 260 fathoms. It is a fossil in Scandinavia, the British Isles, Iceland, northern Russia, Spitsbergen, Siberia, North America, and Greenland.

**Astarte crenata**, Gray.

*Nicania crenata*, Gray, Parry's first Voyage, Suppl. App., 1824, p. 242.

*Astarte crebricostata*, Forbes & Mc. Andrew, Ann. & Mag. Nat. Hist., vol. 19, 1847, p. 98, Pl. 9, fig. 4.

— — Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 456, Pl. 30, fig. 9.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 54, Pl. 5, fig. 7 a—b.

— — Leche, Kgl. Sv. Vetensk. Akad. Handl., vol. 16, no. 2, 1878, p. 16.

— *sulcata* var. *crenata*, Friele, Nyt Mag. f. Naturvidensk., vol. 24, 1878, p. 2.

— *crenata*, Friele, Jahrb. Deutsch. Malacozool. Gesellsch., vol. 6, 1879, p. 267.

— *crebricostata*, Schneider, Tromsøundets Molluskfauna, 1886, p. 80.

**Findested.** Stationerne 237, 260, 261, 262, 267, 270, 273, 275, 290, 323, 326, 357 og Alten 20 fv. Dybde 20—263 fv.

Ved den norske kyst er *astarte crenata* ikke funden søndenfor Lofoten. Den er en høiarktisk art, som er kjendt fra Grønland, Amerikas nord- og østkyst indtil Maine, Island, Jan Mayen, Spitsbergen, Barentshavet, Karahavet og videre østover indtil Taimurhalvøen (Vega station 26). Den bathymetriske udbredelse er 5—410 fv. Fossil er den funden i Skandinavien, Britiske øer, Island, nordlige Rusland og Sibirien.

**Locality.** Stations 237, 260, 261, 262, 267, 270, 273, 275, 290, 323, 326, and 357, and Alten (20 fathoms). Depth 20—263 fathoms.

*Astarte crenata* is not found on the Norwegian coast south of Lofoten. It is a high-arctic species, found off Greenland, the north coast of N. America and east coast down to Maine, Iceland, Jan Mayen, Spitsbergen, in the Barents Sea, the Kara Sea, and eastwards as far as the Taimur Peninsula (Vega Station 26). Its bathymetrical distribution is from 5 to 410 fathoms. It is found as a fossil in Scandinavia, the British Isles, Iceland, the north of Russia, and Siberia.

**Astarte acuticostata**, Jeffreys.

*Astarte acuticostata*, Jeffreys, m. s. Friele Nyt Mag. f. Naturvidensk., vol. 23, 1877, hefte 3, p. 1.

— Friele, Jahrbüch. Deutsch. Malacozool. Gesellsch., vol. 6, 1879, p. 267, Pl. 4, fig. 8.

Jeffreys, Proc. Zool. Soc., 1881, p. 711, Pl. 61, fig. 9.

Vi har her opført denne lille dybbrandsform som en selvstændig art. Muligens bør den dog hellere betragtes som en dybbrandsvarietet af foregaaende, fra hvilken den dog adskiller sig ved sin mere rhombiske form, finere striering og smalere laaspade.

**Findested.** Stationerne 18, 31, 33, 48, 124, 192, 237, 251, 323, 359 og 363. Samtlige stationer med undtagelse af de tre sidste tilhører den kolde area. Dybde 223—649 fv.

*Astarte acuticostata*, er tidligere kjendt fra Færokanalen, 229—450 fv. Jeffreys anfører den fra Novaja Semlja og Osterfjorden ved Bergen, men vi har ikke opdaget den der, uagtet vi har skabet en god del paa dette sted. Den bathymetriske udbredelse er 200—649 fv.

We have here recorded this little deep-water form as a distinct species. It ought, however, possibly to be regarded rather as a deep sea variety of the preceding species, although it is distinguished from that species by its more rhombic form, finer striation, and narrower hinge.

**Locality.** Stations 18, 31, 33, 48, 124, 192, 237, 251, 323, 359, and 363. All these stations, with the exception of the last three, belong to the cold area. Depth 223—649 fathoms.

*Astarte acuticostata* had previously been recorded from the Faroe channel (229—450 fathoms). Jeffreys states its occurrence in Novaja Semlja, and in Oster Fjord near Bergen; but although we have dredged a good deal in the latter locality, we have not detected it. Its bathymetrical distribution is from 200 to 649 fathoms.

**Astarte sulcata**, da Costa,

*Pectunculus sulcatus*, da Costa, Brit. Conch., 1778, p. 192

*Astarte scotica*, Lovén, Ind. Moll. Scand., 1846, p. 36.

— *sulcata*, Forbes & Hanley, Brit. Moll., vol. 1, p. 452, Pl. 30, fig. 6, Pl. 11, fig. 5.

— — Jeffreys, Brit. Conch., vol. 2, 1863, p. 311, Pl. 37, fig. 1 (partim).

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 52.

*Astarte sulcata* fandtes paa station 79, station 173 b og i Vestfjorden, 160 fv. Dybde 160—300 fv.

*Astarte sulcata* was found at Stations 79 and 173 b, and in the West Fjord (160 fathoms). Depth 160—300 fathoms.

Ligesom *astarte compressa* er den en nordatlantisk art. Den synes dog at have en sydligere udbredelse, idet den gaar ned til de Canariske øer, Nordafrikas vestkyst og Middelhavet, hvor den dog er meget sjelden. Dens udbredelse kan for tiden ikke med sikkerhed angives. Den bathymetriske udbredelse er 5—1010 fv. Fossil er den kjendt fra Norge, nordlige Rusland, England, Frankrig, Italien og Sibirien.

This, like *A. compressa*, is a North Atlantic species. It appears, however, to have a more southern distribution, as it extends to the Canary Isles, the north-west coast of Africa, and the Mediterranean, where, however, it is very rare. For the present its distribution cannot be definitely given. Its bathymetrical distribution is from 5 to 1010 fathoms. It is found as a fossil in Norway, the north of Russia, England, France, Italy, and Siberia.

#### ***Astarte compressa*, Linné.**

*Venus compressa*, Linné, Syst. Nat., ed. 12, 1766, p. 1135.

*Astarte elliptica*. Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 459, Pl. 30, fig. 8.

— *compressa*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 53.

— — Leche. Kgl. Sv. Vetensk. Akad. Handl., vol. 16, no. 2, p. 18, Pl. 1, fig. 2, 3 a—b.

*Astarte compressa* blev af Nordhavsekspeditionen kun tagen ved Alten og Hammerfest, 20 fv. Den hører hjemme i det nordlige af Atlanterhavet og tilstødende dele af Ishavet indtil Karahavet. Sydgrænsen er ved de britiske øer og Østersøen, hvor den forekommer indtil Kielerbugten og Bornholm. Paa den amerikanske side gaar den mod syd til Massachusetts. Ved den norske kyst er den særlig talrig inden den arktiske region. Den bathymetriske udbredelse er 5—200 fv. Fossil er den kjendt fra Skandinavien, Britiske øer, Island, Spitsbergen, nordlige Rusland og Sibirien.

*Astarte compressa* was found by the North Atlantic Expedition only at Alten and Hammerfest (20 fathoms). It is a native of the northern part of the Atlantic, and the adjoining portion of the Arctic Ocean as far as the Kara Sea. Its southern limit is at the British Isles and the Baltic, occurring in the latter down to Kiel Bay and Bornholm. On the American side, it extends as far south as Massachusetts. On the Norwegian coast, it is especially numerous within the arctic regions. Its bathymetrical distribution is from 5 to 200 fathoms. It is found as a fossil in Scandinavia, the British Isles, Iceland, Spitsbergen, the north of Russia, and Siberia.

#### ***Astarte banksii*, Leach.**

*Nicania banksii*, Leach, Ross's first Voyage, App. 1819, p. 176.

*Astarte* — Gould & Binney, Rep. Invert of Mass., 1870, p. 125.

*Nicania* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 51, Pl. 6, fig. 1 a—b.

Den typiske form af denne stærkt varierende musling toges ved Hammerfest og Alten.

*Forma globosa* erholdtes paa station 225, 195 fv., og *forma warhami* ved Advent Bay og Magdalena Bay, 20—60 fv.

*Astarte banksii* er en circumpolar art, som er kjendt fra Grønland, Amerikas nord-østkyst indtil kysten af New England, Vesteuropa indtil Biskayerbugten, Skandinavien, Østersøen indtil Kielerbugten og Fehmern, Murmankysten, Island, Jan Mayen, Spitsbergen, Barentshavet, Karahavet, Sibiriens ishavskyster, Beringshavet og Vancouver. Ved de norske kyster er denne art meget almindelig, den høiarktiske form *warhami* dog blot fra Syd-Varanger og *forma globosa* fra Finmarken og Tromsø. Den bathymetriske udbredelse er 5—200 fv. Fossil er den funden i Skandinavien, Britiske øer, Spitsbergen, nordlige Rusland, Sibirien, Nordamerika og Grønland.

The typical form of this exceedingly variable bivalve was found at Hammerfest and Alten.

The form *globosa* was found at Station 225 (195 fathoms), and the form *warhami* in Advent Bay and Magdalena Bay (20—60 fathoms).

*Astarte banksii* is a circumpolar species, known in Greenland, on the north coast of N. America and east coast down to New England, off the coast of Western Europe as far south as the Bay of Biscay, Scandinavia, in the Baltic down to Kiel Bay and Fehmarn, off the Murman Coast, Iceland, Jan Mayen, Spitsbergen, in the Barents Sea, the Kara Sea, on the arctic coasts of Siberia, in the Bering Sea, and Vancouver Island. This species is very common off the Norwegian coast, the high-arctic form, *warhami*, however, only in South Varanger, and *globosa* in Finmark and Tromsø. Its bathymetrical distribution is from 5 to 200 fathoms. It is found as a fossil in Scandinavia, the British Isles, Spitsbergen, the north of Russia, Siberia, North America, and Greenland.



**Montacuta substriata**, Montagu

*Mya substriata*, Montagu, Test. Brit. Suppl., 1809, p. 25.

*Montacuta substriata*, Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 77, Pl. 18, fig. 8, Pl. O, fig. 2.

— — Jeffreys, Brit. Conch., vol. 2, 1863, p. 205, Pl. 31, fig. 6.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 65, Pl. 19, fig. 16 a—b.

*Montacuta substriata* foreligger kun fra station 25, 98 fv. og station 192, 649 fv. (døde skaller).

Denne art, der stadig holder til paa piggerne af *spatangus purpureus* og undertiden ogsaa paa *schizaster fragilis*, *brissopsis lyrifera* og *echinocardium flavescens*, er ret almindelig langs vor kyst op til Øxfjord i Vestfinmarken. Den er udbredt langs Europas vestkyst til Middelhavet og Adriaterhavet, hvor den forekommer paa *cidaris hystrix* og *spatangus meridionalis*. I Kattegat gaar den ifølge Petersen mod syd til Kullen og Anholt. Den bathymetriske udbredelse er 5—722 fv. Fossil er den kjendt fra Norge, England og Italien.

*Montacuta substriata* was only found at Station 25, 98 fathoms, and Station 192 (649 fathoms) (dead specimens).

This species, which lives upon the spines of *Spatangus purpureus*, and sometimes on *Schizaster fragilis*, *Brissopsis lyrifera* and *Echinocardium flavescens*, is quite common along the Norwegian coast up to Øx Fjord in West Finmark. It is distributed along the western shores of Europe, in the Mediterranean and the Adriatic, where it is found upon *Cidaris hystrix* and *Spatangus meridionalis*. In the Kattegat, it extends, according to Petersen, southwards as far as Anholt and Kullen. Its bathymetrical distribution is from 5 to 722 fathoms. It is found as a fossil in Norway, England, and Italy.

**Montacuta dawsoni**, Jeffreys.

*Montacuta dawsoni*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 216, vol. 5, p. 178, Pl. 31, fig. 7.

— — Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 18, 1876, p. 490.

*Montacuta dawsoni* fandtes i et par eksemplarer i Advent Bay, 20—40 fv. Arten er tidligere kjendt fra Grønland, Spitsbergen, Skotland, Irlands vestkyst, Biskayerbugten, Palermo og Norge, hvor Jeffreys har fundet den ved Drøbak, Friele ved Florø. Ifølge Petersen skal endvidere Collin have faaet den i Limfjorden. Den bathymetriske udbredelse er 3—1750 fv.

Two or three specimens of *Montacuta dawsoni* were found in Advent Bay (20—40 fathoms). The species had previously been found off Greenland, Spitsbergen, Scotland, the west coast of Ireland, in the Bay of Biscay, at Palermo, and in Norway by Jeffreys at Drøbak, and by Friele at Florø. According to Petersen, Collin has found it in Limfjord. Its bathymetrical distribution is from 3 to 1750 fathoms.

**Montacuta maltzani**, Verkrüzen.

*Montacuta maltzani*, Verkrüzen, Jahrb. Deut. Malacozool. Gesellsch., vol. 2, 1875, p. 229, Pl. 8, fig. 9.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 69, Pl. 19, fig. 19 a—d.

Denne art erholdtes i talrige eksemplarer ved Beeren Eiland, 18 fv. Tidligere er den blot kjendt fra Novaja Semlja (Herzenstein) og det nordlige Norge, hvor den er tagen ved Vadsø, 10—25 fv., af saavel Verkrüzen som Sars. Sars anfører, at han har modtaget eksemplarer af denne art fra Jeffreys; nærmere lokalitetsangivelser for disse mangler dog.

A number of specimens of this species were found at Bear Island (18 fathoms). It is previously known only in Novaja Semlja (Herzenstein), and the north of Norway, where it was found at Vadsø (10—25 fathoms) by both Verkrüzen and Sars. Sars states that he has received specimens of this species from Jeffreys, but there was no statement of the locality given.

**Montacuta vøringi**, Friele.

- Montacuta vøringi*, Friele, Nyt Mag. f. Naturvidensk., vol. 23, hefte 3, 1877, p. 1, fig. 1.  
 — Jeffreys, Proc. Zool. Soc., 1881, p. 697.  
 — Friele, Norske Nordhavs Exp., Moll. vol. 2, 1886, p. 37, Pl. 12, fig. 11, 12.

Af Nordhavsekseditionen fandtes denne art blot i et venstre skal paa station 1, Sognefjord, 650 fv. Den er endvidere funden af „Porcupine“ udenfor Kanalen, 539—725 fv. og ved Spaniens sydvestkyst, 292—364 fv. Monterosato har den fra Palermo, 87 fv. Fossil er den funden af professor Münster i vore glaciële afleiringer.

Only a left valve of this species was found by the North Atlantic Expedition at Station 1, Sogne Fjord (650 fathoms). The species has also been found by the 'Porcupine' to the west of the English Channel (539—725 fathoms), and off the south-west coast of Spain (292—364 fathoms). Monterosato found it at Palermo (87 fathoms). It has been found as a fossil by Professor Münster in Norwegian glacial deposits.

**Kelliella miliaris**, Philippi.

- Venus miliaris*, Philippi, Enum. Moll. Siciliae, vol. 2, 1844, p. 36, Pl. 14, fig. 15.  
*Kelliella abyssicola*, M. Sars, Nyt Mag. f. Naturvidensk., vol. 17, 1870, p. 201, Pl. 12, fig. 11—15, Pl. 13.  
*miliaris*, G. O. Sars, Moll. Reg. Arct., Norv., 1878, p. 65, Pl. 19, fig. 15 a—c.

**Findested.** Stationerne 1, 101, 124, 192 og 255. Dybde 223—650 fv.

*Kelliella miliaris* er almindelig paa de større dyb langs vor syd- og vestkyst op til Tromsø, hvor den fandtes af dr. A. Krause i et dødt men vel vedligeholdt exemplar. Arten er sydlig udbredt til Middelhavet. Den bathymetriske udbredelse er 40—650 fv. Fossil er den kun med sikkerhed paavist i Italien.

**Locality.** Stations 1, 101, 124, 192, and 255. Depth 223—650 fathoms.

*Kelliella miliaris* is common in the deeper water along the south coast of Norway and the west coast up to Tromsø, where Dr. A. Krause found a dead, but well-preserved specimen. The species extends southwards to the Mediterranean. Its bathymetrical distribution is from 40 to 650 fathoms. As a fossil it is only known with certainty from Italy.

**Kellia suborbicularis**, Montagu.

- Mya suborbicularis*, Montagu, Test. Brit., 1803, p. 39 og p. 564.  
*Kellia* — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 87, Pl. 18, fig. 9 a, b, Pl. O, fig. 4.  
 — — Jeffreys, Brit. Conch., vol. 2, 1863, p. 225, Pl. 32, fig. 2.  
 — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 67, Pl. 19, fig. 14 a—b.

Denne art fandtes ved Bodø, 40 fv., og i nogle unge exemplarer paa station 192, 649 fv.

*Kellia suborbicularis* er en kosmopolitisk art, som er kjendt fra Europas Atlanterhavskyster, Middelhavet, Adriaterhavet, Egeerhavet, Nordafrikas vestkyst indtil Cap Vert, Kanariske øer, Madeira, Nordamerikas øst- og vestkyst, Indiske ocean og Kerguelen. Hos os er den tagen i Kristianiafjorden og langs vestkysten op til Lofoten. Den bathymetriske udbredelse er 10—808 fv. Fossil er den kjendt fra Norge, Murmankysten, England, Irland og Italien.

This species was found at Bodø (40 fathoms), and a few young specimens at Station 192 (649 fathoms).

*Kellia suborbicularis* is a cosmopolitan species, known off the Atlantic shores of Europe, in the Mediterranean, the Adriatic, the Ægean Sea, off the north-west coast of Africa down to Cape Verd, the Canary Isles, Madeira, the east and west coasts of North America, in the Indian Ocean, and off Kerguelen Island. In Norway, it has been found in the Christiania Fjord and along the west coast up to Lofoten. Its bathymetrical distribution is from 10 to 808 fathoms. It is found as a fossil in Norway, on the Murman Coast, in England, Ireland, and Italy.

**Kellia symmetros**, Jeffreys.

*Kellia symmetros*, Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 18, 1876, p. 491.

— — — Locard, Exp. Sci. „Travailleur“ & „Talisman“, Moll. Test., vol. 2, 1898, p. 297, Pl. 13, fig. 18—20.

**Findested.** Stationerne 87, 283, 295 og 312. Dybde 498—1110 fv.

Denne lille yderst sjældne musling har Valorous taget i munden af Baffinsbugten, Travailleur i Biskayerbugten. Den bathymetriske udbredelse er 300—1750 fv.

Vore exemplarer, som i sin tid blev revideret af Jeffreys, passer ikke med Locards tegninger. Disse synes heller ikke at samstemme med Jeffreys beskrivelse. Jeffreys siger saaledes, at skallet er „triangularly oval, equilateral“. Locards tegninger viser derimod et temmelig skjævt skal.

De største exemplarer var 3.5 mm. lang, 3 mm. høi.

**Locality.** Stations 87, 283, 295, and 312. Depth 498—1110 fathoms.

The 'Valorous' found this exceedingly rare little bivalve at the mouth of Baffin Bay, and the 'Travailleur' in the Bay of Biscay. Its bathymetrical distribution is from 300 to 1750 fathoms.

The North Atlantic Expedition specimens, which have been determined by Jeffreys, do not agree with Locard's drawings, nor do the latter answer to Jeffreys' description. Jeffreys says, for instance, that the valve is 'triangularly oval, equilateral'; but Locard's drawings represent a rather oblique valve.

The largest specimens measured 3.5 mm. in length, and 3 mm. in height.

**Cyamium minutum**, Fabricius.

*Venus minuta*, Fabricius, Fau. Grøn., 1780, p. 412.

*Cyamium minutum*, Lovén, Ind. Moll. Scand., 1846, p. 42.

*Turtonia minuta*, Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 81, Pl. 18, fig. 7, Pl. O, fig. 1.

*Cyamium minutum*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 260, Pl. 23, fig. 4.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 65, Pl. 19, fig. 12 a—c.

*Cyamium minutum* fandtes talrig paa grundt vand ved Husøen. Den er en circumpolar art, som er kjendt fra Grønlands vestkyst, Nordamerikas østkyst, hvor den er udbredt fra Massachusetts til Syd Carolina, Middelhavet, Frankriges vestkyst, Britiske øer, Færøerne, Island, Skandinavien, hvor den er talrig fra Finnmarken til Bohuslän, Murmankysten, Hvidhavet, Beringshavet og Alaska. Den bathymetriske udbredelse er 0—25 fv. M. Sars har fundet den fossil i vore yngre glaciële skjælbanker. Knipowitsch anfører den som post-pliocen fra Murmankysten (Port Wladimir).

*Cyamium minutum* was found in large numbers in shallow water at Husø. It is a circumpolar species, known on the west coast of Greenland, the east coast of North America — where it extends from Massachusetts to South Carolina —, in the Mediterranean, on the west coast of France, in the British Isles, the Faroe Isles, Iceland, Scandinavia — where it is numerous from Finnmark to Bohuslän —, on the Murman Coast, in the White Sea, the Bering Sea, and Alaska. Its bathymetrical distribution is from 0 to 25 fathoms. M. Sars found it as a fossil in the Norwegian later glacial shell-banks. Knipowitsch mentions it as Post-pliocene on the Murman Coast (Port Vladimir).

**Lasæa rubra**, Montagu.

*Cardium rubrum*, Montagu, Test. Brit., 1803, p. 83, Pl. 27, fig. 14.

*Kellia rubra*, Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 94, Pl. 36, fig. 5—7, Pl. O, fig. 3.

*Lasæa* — Jeffreys, Brit. Conch., vol. 2, 1863, p. 219, Pl. 32, fig. 1.

Denne ved vore kyster sjældne art fandtes meget talrig under stene og blandt conferyer ved Husøen. Her er den ogsaa tidligere tagen af Hansen og Friele. Inden Skandinavien blev den først paavist af Lilljeborg ved fiskeværer Grip udenfor Christiansund. Senere er den funden af

This species which is rare on the Norwegian coast, was found under stones and among confervæ at Husø, where it had previously been found by Hansen and Friele. Its presence in Scandinavia was first proved by Lilljeborg at the fishing-station Grip, off Christiansund. It was subse-



Friele ved Florø og af Norman paa et par lokaliteter i Korsfjorden.

*Lasæa rubra* synes at være en kosmopolitisk art, som anføres saavel fra Atlanterhavet som Det stille ocean. Den bathymetriske udbredelse er 0—910 fv. Fossil er den kjendt fra Italien, Irland, England og Norge, hvor M. Sars har taget den i skjælbanken paa Kirkøen, Hvaløerne.

quently found at Florø by Friele, and in two or three places in Kors Fjord by Norman.

*Lasæa rubra* appears to be a cosmopolitan species, recorded from both the Atlantic and Pacific Oceans. Its bathymetrical distribution is from 1 to 910 fathoms. It is found in a fossil state in Italy, Ireland, England, and Norway. In the last-named country, it was found by M. Sars in the shell-bank on Kirkøen, in the Hval Islands.

#### **Lasæa pumila, S. Wood.**

*Lasæa pumila*, S. Wood, Crag. Moll. vol. 2, 1850, p. 124, tab. 12, fig. 15 a—b.

— Friele, Nordhavsexp. Moll. vol. 2, 1886, p. 37, Pl. 12, fig. 13 a—b.

— Locard, Exp. Sci. Travailleux & Talisman, Moll. Test. vol. 2, 1898, p. 299.

*Lasæa pumila* erholdtes kun paa en lokalitet, station 192, 649 fv. Den er tidligere kjendt fra Islands vestkyst, Kanalen, Biskayerbugten, kysten af Spanien og Portugal, Sicilien, Adriaterhavet og Azorerne. Jeffreys anfører den desuden fra Korea. Den bathymetriske udbredelse er 60—1367 fv. Fossil er den kjendt fra Englands cragformationer og Siciliens pliocene lag.

*Lasæa pumila* was found in only one locality, namely Station 162 (649 fathoms). Its occurrence had previously been recorded off the west coast of Iceland, in the English Channel, the Bay of Biscay, off the coast of Spain and Portugal, Sicily, in the Adriatic, and the Azores. Jeffreys mentions it also in the Corea. Its bathymetrical distribution is from 60 to 1367 fathoms. It is found as a fossil in the crag in England, and in the Pliocene strata in Sicily.

#### **Axinopsis orbiculata, G. O. Sars.**

*Axinopsis orbiculata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 63, Pl. 19, fig. 11 a—d.

*Axinus orbicularis*, Friele, Nyt. Mag. f. Naturvidensk. vol. 28, 1878, p. 3, fig. 3 a—c.

*Axinopsis orbiculata*, Bush, Proc. U. S. Nat. Museum, vol. 6, 1883, p. 243, Pl. 9, fig. 4.

**Findested.** Jan Mayen, 10—20 fv., Norskoerne og Fair Harbour, 30 fv.

*Axinopsis orbiculata* er en circumpolar art, som er kjendt fra Grønland, Labrador, New Foundland, Island, Norge, Jan Mayen, Spitsbergen, Murmankysten, Novaja Semlja, Karahavet og Alaska. Ved den norske kyst er den temmelig sjelden, idet den kun er funden paa nogle faa lokaliteter mellem Bodø og Vadsø. Den bathymetriske udbredelse er 2—120 fv. Knipowitsch anfører den som post-pliocen fra Spitsbergen (Krausshavn).

*Axinus orbiculatus*, Jeffreys (Proc. Zool. Soc. 1881 p. 702, tab. 61, fig. 5) er ikke Sars's art, saavel formen som ogsaa skulpturen er høist forskjellig. Vi frygter derfor for at der er nogen misforstaaelse tilstede, naar Posselt i „Conspectus Faunæ Grønlandicæ“ (p. 75) slaar begge former sammen. Det maa forøvrigt bemærkes at Jeffreys fremhæver udtrykkelig at de ikke er identiske.

**Locality.** Jan Mayen Island (10—20 fathoms), the Norwegian Islands and Fair Harbour (30 fathoms).

*Axinopsis orbiculata* is a circumpolar species, known in Greenland, Labrador, Newfoundland, Iceland, Norway, Jan Mayen, Spitsbergen, on the Murman Coast, in Novaja Semlja, the Kara Sea, and Alaska. It is rather rare on the Norwegian coast, being only found in a few places between Bodø and Vadsø. Its bathymetrical distribution is from 2 to 120 fathoms. Knipowitsch mentions it as Post-pliocene in Spitsbergen (Krausshavn).

*Axinus orbiculatus*, Jeffreys (Proc. Zool. Soc. 1881, p. 702, Pl. LXI, fig. 5) is not Sars's species. Both in form and sculpturing, it is quite different. We fear, therefore, that Posselt is labouring under some misapprehension when, in „Conspectus Faunæ Grønlandicæ“ (p. 75), he unites the two forms. It may moreover be remarked that Jeffreys expressly states that they are not identical.

**Diplodonta torelli**, Jeffreys

*Diplodonta torelli*, Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 18, 1876, p. 493.

— — Friele, Jahrb. Deutsch. Malacozool. Gesellsch., vol. 6, 1879, p. 267.

Af denne art foreligger der kun fra Norskoerne, 10—20 fv., et yngre individ og et høire skal, der var 21 mm. langt og 24 mm. bredt.

*Diplodonta torelli* er kun kjendt fra Spitsbergen. Valorous expeditionen hjembragte fragmenter fra station 12, 56° 11' N. Br., 37° 41' V. Lg., 1450 fv., antagelig horer dog ikke arten hjemme paa dette dyb, men er uddrevet af isen.

A young specimen, and a right valve measuring 21 mm. in length and 24 mm. in breadth, from the Norwegian Islands (Spitsbergen) (10—20 fathoms), is all that was found of this species.

*Diplodonta torelli* is only known from Spitsbergen. The Valorous Expedition brought back fragments from Station 12 (56° 11' N. Lat., 37° 41' W. Long., 1450 fathoms); but the species is probably not a native of this depth, but has been carried out by the ice.

**Axinus flexuosus**, Montagu.

*Tellina flexuosa*, Montagu, Test. Brit., vol. 1, 1803, p. 72.

*Axinus flexuosus* og *sarsii*, Lovén, Ind. Moll. Scand., 1846, p. 38.

*Lucina flexuosa*, Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 54, Pl. 35, fig. 4.

*Axinus flexuosus*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 247, vol. 5, p. 179, Pl. 33, fig. 1.

— — *sarsii* og *gouldii*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 59 og 60, Pl. 19, fig. 4, 5, 6.

*Axinus flexuosus* er en af de hyppigst forekommende mollusker, idet den foreligger fra ikke mindre end 29 lokaliteter: stationerne 1, 2, 9, 18, 31, 33, 79, 87, 137, 192, 223, 224, 251, 255, 261, 262, 267, 273, 290, 323, 326, 338, 357. Desuden toges den i Sognefjord 100 fv., Husø, Advent Bay og Magdalena Bay, 20—30 fv. Dybde 20—672 fv.

Exemplarerne tilhører dels hovedformen *flexuosus*, dels varieteterne *sarsii* og *gouldii*. Den sidste synes særlig at være en arktisk form, idet samtlige eksemplarer fra Jan Mayen og Spitsbergens omraade tilhører denne. Ved Grønlands østkyst er det ligeledes blot denne, som optræder (Posselt).

Flere malacologer betragter saavel *sarsii* som *gouldii* som selvstændige arter, men maa vi med Jeffreys anse dem som varieteter, da de gaar umærkelig over i hinanden.

*Axinus flexuosus* er en circumpolar art, som inden Atlanterhavsomraadet gaar mod syd til Adriaterhavet, Middelhavet, Nordafrikas vestkyst, Azorerne, Kanariske øer, St. Thomas og Den mexikanske golf. Inden det pacifik-arktiske omraade er den kjendt fra Sibiriens ishavskyster, Beringshavet, Korea og Nordamerikas vestkyst indtil Kalifornien. Den er almindelig langs hele den norske kyst, formen *gouldii* er dog sjelden søndenfor Bodø. Den bathymetriske udbredelse er 5—1095 fv. Fossil er den kjendt fra Spitsbergen, Grønland, Nordamerika, Skandinavien, nordlige Rusland, Britiske øer, Belgien, Frankrig, Italien og Madeira.

*Axinus flexuosus* is one of the most frequently-occurring molluscs, having been found in no less than 29 localities, namely, Stations 1, 2, 9, 18, 31, 33, 79, 87, 137, 192, 223, 224, 251, 255, 261, 262, 267, 273, 290, 323, 326, 338, and 357. It was moreover found in the Sogne Fjord (100 fathoms), Husø, Advent Bay, and Magdalena Bay (20—30 fathoms). Depth 20—672 fathoms.

Some of the specimens belong to the principal form *flexuosus*, and some to the varieties *sarsii* and *gouldii*. The last-named appears especially to be an arctic form, as all the specimens from the Jan Mayen and Spitsbergen region belong to it, and it is also the only form appearing on the east coast of Greenland (Posselt).

Several malacologists regard both *sarsii* and *gouldii* as distinct species; but we agree with Jeffreys in considering them as varieties, as the transition from the one to the other is imperceptible.

*Axinus flexuosus* is a circumpolar species, which, in the Atlantic region, extends southwards to the Adriatic, the Mediterranean, the north-west coast of Africa, the Azores, the Canary Islands, St. Thomas, and the Gulf of Mexico. In the Pacific-Arctic region, it is known off the Siberian shores of the Arctic Ocean, in the Bering Sea, the Corea, and off the west coast of North America down to California. It is common all along the Norwegian coast, the form *gouldii*, however, being rare south of Bodø. Its bathymetrical distribution is from 5 to 1095 fathoms. It is found as a fossil in Spitsbergen, Greenland, North America, Scandinavia, the north of Russia, the British Isles, Belgium, France, Italy, and Madeira.

**Axinus croulinensis**, Jeffreys.

- Clausina croulinensis*, Jeffreys, Ann. & Mag. Nat. Hist., vol. 20, 1847, p. 19.  
 — — Jeffreys, Ann. & Mag. Nat. Hist., ser. 3, vol. 2, 1858, p. 122, Pl. 5, fig. 2 a—c.  
*Axinus* — Jeffreys, Brit. Conch., vol. 2, 1863, p. 250, Pl. 5, fig. 2 a—c.  
 — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 62, Pl. 19, fig. 8 a—b.

*Axinus croulinensis* erholdtes kun paa en lokalitet, station 192, 649 fv., her i flere men døde eksemplarer.

Ved vore kyster er den ret almindelig paa de større dyb op til Lofoten. Den er endvidere kjendt fra Grønlands vestkyst, Murmankysten, Færøerne, Shetlandsøerne, Island, Kanalen, Biskayerbugten, kysterne af Spanien og Portugal, Middelhavet, Adriaterhavet, Nordafrikas vestkyst, Canariske øer, Azorerne, Madeira og Bermudas. Den bathymetriske udbredelse er 20—1476 fv. Fossil er den kjendt fra Gedgrave og Italien.

Several specimens of *Axinus croulinensis* were obtained, at Station 192, (649 fathoms; dead specimens).

It is quite common on the Norwegian coast in deep water up to Lofoten. It is further recorded from the west coast of Greenland and the Murman Coast, the Faroe Isles, the Shetlands, Iceland, the English Channel, the Bay of Biscay, the coast of Spain and Portugal, the Mediterranean, the Adriatic, the north-west coast of Africa, the Canary Isles, the Azores, Madeira, and Bermuda. Its bathymetrical distribution is from 20 to 1476 fathoms. It is known as a fossil in Gedgrave and Italy.

**Axinus eumyarius**, M. Sars.

- Axinus eumyarius*, M. Sars, Nyt Mag. f. Naturvidensk., vol. 17, 1870, p. 87, Pl. 12, fig. 7—10.  
 — Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 18, 1876, p. 492.  
 — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 62, Pl. 19, fig. 9 a—b.

*Axinus eumyarius* foreligger fra station 2, 672 fv. og station 255, Vestfjorden, 341 fv.

Paa de større dyb langs vor syd- og vestkyst op til Lofoten er denne art ret almindelig. Den er endvidere kjendt fra Davisstrædet, munden af Kanalen, Biskayerbugten, kysterne af Spanien og Portugal, Middelhavet og Azorerne. Den bathymetriske udbredelse er 40—1456 fv. Fossil er den kun kjendt fra de pliocene lag paa Sicilien.

*Axinus eumyarius* was found at Station 2 (672 fathoms), and Station 255, West Fjord (341 fathoms).

This species is common in deep water along the south coast of Norway, and the west coast up to Lofoten. It is also known in Davis Strait, at the mouth of the English Channel, in the Bay of Biscay, off the coast of Spain and Portugal, in the Mediterranean, and off the Azores. Its bathymetrical distribution is from 40 to 1456 fathoms. It is found as a fossil only in the Pliocene beds in Sicily.

**Axinus ferruginosus**, Forbes.

- Kellia ferruginosa*, Forbes, Brit. Ass. Rep., 1843, p. 192.  
*Lucina* — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 60, Pl. 34, fig. 1.  
*Axinus ferruginosus*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 251, vol. 5, p. 180, Pl. 33, fig. 3.  
 — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 63, Pl. 19, fig. 10 a—b.

**Findested.** Stationerne 9, 192, 290, 326, Husø og Sognefjord, 10 fv. Dybde 100—649 fv.

*Axinus ferruginosus* er en circumpolar art, som er kjendt fra Grønland, Nordamerika, Beringshavet, Europas Atlanterhavskyster, Middelhavet, Adriaterhavet, Nordafrikas vestkyst. Ifølge Jeffreys erholdt Challengerexpeditionen den ved Azorerne. Den er imidlertid ikke optagen i Smiths monografi over denne expeditions bivalver. Ved vore kyster var den tidligere ikke funden nordenfor Lofoten. Heller ikke

**Locality.** Stations 9, 192, 290, and 326, Husø and the Sogne Fjord (100 fathoms). Depth 100—649 fathoms.

*Axinus ferruginosus* is a circumpolar species, recorded from Greenland, North America, the Bering Sea, the Atlantic shores of Europe, the Mediterranean, the Adriatic, and the north-west coast of Africa. According to Jeffreys, the Challenger Expedition found it at the Azores, but it is not included in Smith's monograph on the bivalves of the expedition. On the Norwegian coast,



anføres den fra Murmankysten. Den bathymetriske udbredelse er 30—1459 fv. Fossil er den kjendt fra Norge, England og Italien.

it is not found north of Lofoten; nor is it recorded from the Murman Coast. Its bathymetrical distribution is from 30 to 1459 fathoms. It is a fossil in Norway, England, and Italy.

### **Cardium ciliatum. Fabricius.**

*Cardium ciliatum*, Fabricius, Fauna Grønlandica, 1780, p. 410.

— *islandicum*, Gould & Binney, Rep. Invert. Mass., ed. 2, 1870, p. 139.

— *ciliatum*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 46, Pl. 5, fig. 4 a—b.

— — Leche, Kgl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 21.

**Findested.** Magdalena Bay og Advent Bay, 20—60 fv.

*Cardium ciliatum* er en circumpolar art, som er kjendt fra Grønland, Amerikas nord- og østkyst til New England, Beringshavet, Japan, Sitka, Sibirien, Karahavet, Novaja Semlja, Barentshavet, Spitsbergen, Island, Murmankysten, Hvidehavet og Norge, hvor den dog blot er funden levende paa en lokalitet, Vadsø. Den bathymetriske udbredelse er 4—380 fv. Fossil er den funden over en større del af Nordeuropa og det nordlige Amerika, Spitsbergen, Grønland og Sibirien.

**Locality.** Magdalena and Advent Bays (20—60 fathoms).

*Cardium ciliatum* is a circumpolar species, known off Greenland, the north coast of North America and the east coast down to New England, in the Bering Sea, Japan, Sitka, Siberia, the Kara Sea, Novaja Semlja, the Barents Sea, Spitsbergen, Iceland, off the Murman Coast, in the White Sea, and off Norway. In the last-named country, it has only been found living in one locality, namely, Vadsø. Its bathymetrical distribution is from 4 to 380 fathoms. It is a fossil in a large part of Northern Europe and the north of North America, in Spitsbergen, Greenland and Siberia.

### **Cardium elegantulum, Beck.**

*Cardium elegantulum*, Beck, Møller, Ind. Moll. Grøn., 1842, p. 20.

— Gould & Binney, Rep. Invert. Mass., ed. 2, 1870, p. 141.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 47, Pl. 5, fig. 5 a—b.

**Findested.** Hammerfest, station 260 og 261, 127 fv.

Denne vakre arktiske art er kjendt fra Grønland, Nordamerikas østkyst, Island, Murmankysten og Norge, hvor den har sin sydgrænse ved Lofoten. Den bathymetriske udbredelse er 15—250 fv. M. Sars har fundet den fossil i vore yngre glaciële skjælbanker; Knipowitsch har den fra afleiringer ved Dwina, hvad der er af saa meget større interesse, da *cardium elegantulum* ikke er funden blandt den recente fauna i Hvidehavet.

**Locality.** Hammerfest, Stations 260 and 261 (127 fathoms).

This beautiful arctic species has been found in Greenland, on the east coast of North America, in Iceland, on the Murman Coast, and in Norway, north of Lofoten. Its bathymetrical distribution is from 15 to 250 fathoms. M. Sars found it as a fossil in the later glacial shell-banks of Norway, Knipowitsch in deposits near the Dwina, this being yet more interesting from the fact that *Cardium elegantulum* is not found among the recent fauna in the White Sea.

**Cardium minimum, Philippi.**

- Cardium minimum*, Philippi, Enum. Moll. Sicil., vol. 1, 1836, p. 51, vol. 2, p. 38, Pl. 14, fig. 18.  
*succicum*, Lovén, Ind. Moll. Scand., 1846, p. 36.  
 — — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 27, Pl. 32, fig. 3.  
 — *minimum*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 292, Pl. 35, fig. 6.  
 — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 48.

**Findested.** Sognefjord, Husø, Hammerfest, 100 fv., station 177, 1443 fv. og station 260, 127 fv.

*Cardium minimum* er fortrinsvis en østatlantisk art, som er udbredt fra Finmarken og Island til Nordafrikas vestkyst og Middelhavet. Desuden er den funden i Diskofjorden, Vestgrønland. Herzenstein anfører den under tvivl fra Karahavet. Den bathymetriske udbredelse er 5—1443 fv. Fossil er den funden i Norge, Skotland, Italien og Rhodes.

**Locality.** The Sogne Fjord, Husø, Hammerfest (100 fathoms), Stations 177 (1443 fathoms) and 260 (127 fathoms).

*Cardium minimum* is especially an east-Atlantic species, extending from Finmark and Iceland to the north-west coast of Africa and the Mediterranean. It is moreover found in Disco Fjord in West Greenland. Herzenstein mentions it with some doubt as found in the Kara Sea. Its bathymetrical distribution is from 5 to 1443 fathoms. It is a fossil in Norway, Scotland, Italy, and Rhodes.

**Cardium fasciatum, Montagu.**

- Cardium fasciatum*, Montagu, Test. Brit. Suppl., 1808, p. 30, Pl. 27, fig. 6.  
 — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 25, Pl. 32, fig. 5, Pl. N, fig. 1.  
 — — Jeffreys, Brit. Conch., vol. 2, 1863, p. 281, Pl. 35, fig. 3.  
 — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 48.

**Findested.** Husø, Bodo og Hammerfest.

*Cardium fasciatum*, har omtrent samme udbredelse som foregaaende art, idet den er kjendt fra Finmarken, Murmankysten og Island til Middelhavet og Canariske øer; endvidere er den funden ved Julianehaab, Vestgrønland. Den bathymetriske udbredelse er 10—808 fv. Fossil er den funden i Skandinavien, nordlige Rusland, Britiske øer og Italien.

**Locality.** Husø, Bodo, and Hammerfest.

*Cardium fasciatum*, has about the same distribution as the preceding species, having been found from Finmark, the Murman Coast, and Iceland, down to the Mediterranean and the Canary Isles. It is also found at Julianehaab in west Greenland. Its bathymetrical distribution is from 10 to 808 fathoms. It is a fossil in Scandinavia, the north of Russia, the British Isles, and Italy.

**Serripes grønlandicum, Chemnitz.**

- Cardium grønlandicum*, Chemnitz, Conch. Cab., vol. 6, 1782, p. 202, Pl. 19, fig. 198.  
*Serripes* — Chenu, Man. de Conch., vol. 2, 1862, p. 109, figs. 496—498.  
*Aphrodite grønlandica*, Gould & Binney, Rep. Invert. Mass., ed. 2, 1870, p. 144.  
 — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 49, Pl. 5, fig. 3 a—b.

**Findested.** Talrig ved Jan Mayen, 10—20 fv., Norskøerne, Magdalena Bay og Advent Bay, 20—60 fv. Paa station 312, 658 fv., toges nogle fragmenter, som antagelig af isen er ført ud paa dybet.

*Serripes grønlandicum* forekommer hos os kun levende i Varangerfjorden. Den er en circumpolar art, som er kjendt fra Grønland, Nordamerika indtil Cape Cod og Oregon, Beringstrædet, Japan, Sibirien, Karahavet, Novaja Semlja, Hvidehavet, Murmankysten, Barentshavet, Spitsbergen, Jan Mayen og Island. Ved de britiske kyster

**Locality.** In large numbers off Jan Mayen (10—20 fathoms), the Norwegian Islands, in Magdalena Bay and Advent Bay (20—60 fathoms). At Station 312 (658 fathoms), some fragments were brought up, which had probably been carried out into deep water by the ice.

In Norway, *Serripes grønlandicum* occurs in the living state only in Varanger Fjord. It is a circumpolar species, known from Greenland, North America down to Cape Cod and Oregon, Bering Strait, Japan, Siberia, the Kara Sea, Novaja Semlja, the White Sea, the Murman Coast, in the Barents Sea, Spitsbergen, Jan Mayen, and Iceland.

er den tagen subfossil. Den bathymetriske udbredelse er 2—170 fv. Fossil er den kjendt fra Grønland, Island, Spitsbergen, nordlige Rusland og Sibirien.

Off the British coasts, it is sub-fossil. Its bathymetrical distribution is from 2 to 170 fathoms. It is found as a fossil in Greenland, Iceland, Spitsbergen, the north of Russia, and Siberia.

#### **Venus casina, Linné.**

*Venus casina*, Linné, Syst. Nat., ed. 12, 1766, p. 1130.

— Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 405, Pl. 24, figs. 1, 5, 6.

— Jeffreys, Brit. Conch., vol. 2, 1863, p. 337, vol. 5, p. 184, Pl. 38, fig. 5.

— Pfeiffer, Mart. Chemn. Conch. Cab., vol. 11, part 1, 1869, p. 137, Pl. 8, figs. 4, 5.

**Findested.** Husø, 40—60 fv.

Den forekommer spredt langs vor syd- og vestkyst op til Trondhjemsfjorden, desuden anfører Lovén den fra Vardø. *Venus casina* er en østatlantisk art, der gaar mod syd til Middelhavet, Madeira, Canariske øer og Azorerne. Den bathymetriske udbredelse er 0—450 fv. Fossil er den funden i Norge, Britiske øer, Belgien, Frankrige, Italien og Grækenland.

**Locality.** Husø (40—60 fathoms).

It occurs sparsely along the south coast of Norway and the west coast up to the Trondhjem Fjord; and it is also mentioned by Lovén as found at Vardø. *Venus casina* is an east-Atlantic species, which extends southwards to the Mediterranean, Madeira, the Canary Isles, and the Azores. Its bathymetrical distribution is from 0 to 450 fathoms. It is a fossil in Norway, the British Isles, Belgium, France, Italy, and Greece.

#### **Venus ovata, Pennant.**

*Venus ovata*, Pennant, Brit. Zool., vol. 4, 1767, p. 97, Pl. 56, fig. 56.

— — Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 419, Pl. 24, fig. 2, Pl. 26, fig. 1, Pl. L, fig. 6.

— — Jeffreys, Brit. Conch., vol. 2, 1863, p. 342, Pl. 39, fig. 1, 1 a.

*Timoclea* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 56.

**Findested.** Husø, 40—60 fv. og ved station 173 b, 300 fv.

*Venus ovata* forekommer langs hele den norske kyst, men er dog sjelden i Finmarken. Den har omtrent samme udbredelse som foregaaende art; den forekommer langs de europæiske kyster fra Finmarken og Island til Middelhavet, Nordafrikas vestkyst og Azorerne. Den bathymetriske udbredelse er 0—1324 fv. Fossil er den funden over en større del af Europa, Algier og Madeira.

**Locality.** Husø (40—60 fathoms), and at Station 173 b (300 fathoms).

*Venus ovata* occurs all along the Norwegian coast, but is rare in Finmark. It has about the same distribution as the preceding species, occurring off the European coasts from Finmark and Iceland to the Mediterranean, the north-west coast of Africa, and the Azores. Its bathymetrical distribution is from 0 to 1324 fathoms. It is a fossil in many parts of Europe, in Algiers and Madeira.

#### **Venus fluctuosa, Gould.**

*Venus fluctuosa*, Gould, Rep. Invert. Mass., 1841, p. 87, fig. 70.

— *astartoides*, Middendorff, Beitr. Malac. Ross, part 3, 1849, p. 56.

— — Middendorff, Sibir. Reise, 1851, p. 252, Pl. 20, figs. 5—13.

*Tapes* — Gould & Binney, Rep. Invert. Mass., ed. 2, 1870, p. 136.

**Findested.** Norskoerne, 10—20 fv. Ved station 312, 656 fv. og station 353, 1333 fv., toges desuden nogle fragmenter, som antagelig er ført ud paa dybet af isen.

**Locality.** Norwegian Islands (10—20 fathoms). At Stations 312 (656 fathoms) and 353 (1333 fathoms), some fragments were also found, which had probably been carried out into deep water by the ice.



*Venus fluctuosa* er circumpolar. Den er kjendt fra Grønland, Nordamerikas nord- og østkyst indtil Massachusetts, Spitsbergen, Frantz Josefsland, Hvidehavet, Novaja Semlja, Karahavet, Sibiriens ishavskyster, Beringshavet, Okotske hav og Japan. Den bathymetriske udbredelse er 4—100 fv.

*Venus fluctuosa* is circumpolar. It is known off Greenland, the north coast of North America and the east coast down to Massachusetts, Spitsbergen, Franz Josef Land, in the White Sea, Novaja Semlja, the Kara Sea, on the Arctic shores of Siberia, in the Bering Sea, the Sea of Okhotsk, and in Japan. Its bathymetrical distribution is from 4 to 100 fathoms.

### *Tapes virginea*, Linné.

*Venus virginea*, Linné, Syst. Nat., ed. 1766, p. 1136.

*Tapes* — Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 388, Pl. 25, figs. 4, 6.

— — Jeffreys, Brit. Conch., vol. 2, p. 352, Pl. 6, fig. 5, vol. 5, Pl. 39, fig. 5.

**Findested.** Husø, 40—60 fv.

Den er udbredt fra Norge og Færøerne til Middelhavet og Adriaterhavet. Jeffreys anfører den ogsaa fra Finmarken, men maa dette bero paa en forveksling, thi den anføres hverken af Sars, Schneider eller andre forfattere fra det nordlige Norge. Den bathymetriske udbredelse er 5—180 fv. Fossil er den kjendt fra Madeira og en større del af Europa.

**Locality.** Husø (40—60 fathoms).

It is distributed from Norway and the Faroe Isles to the Mediterranean and the Adriatic. Jeffreys also mentions its occurrence in Finmark; but this must be a mistake, as it is neither mentioned by Sars, Schneider, nor other authors, as occurring in the north of Norway. Its bathymetrical distribution is from 5 to 180 fathoms. It is a fossil in Madeira and many parts of Europe.

### *Syndesmya longicallis*, Scacchi.

*Tellina longicallis*, Scacchi, Not. foss. Gravina, 1836, p. 16, Pl. 1, fig. 7.

*Erycina* — Philippi, Enum Moll. Siciliæ, vol. 2, 1844, p. 9, Pl. 13, fig. 7.

*Abra* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 74, Pl. 6, fig. 3 a—c, Pl. 20, fig. 4.

*Syndesmya* — Locard, Exp. Sci. Travailleux & Talisman, Moll. Test., vol. 2, 1898 p. 224, Pl. 12, figs. 32—33.

**Findested.** Stationerne 1, 9, 10, 79 og 149, Sognefjord og Husø, 100 fv. Dybde 100—650 fv.

*Syndesmya longicallis* er en dybvandsform, som er almindelig paa de større dyb langs vor syd- og vestkyst op til Lofoten. Derimod er den ikke funden ved Tromsø og Finmarken. Den gaar mod syd til Middelhavet, Nordafrikas vestkyst og Azorerne. Langs Amerikas østkyst er den udbredt fra New England til Brasilien. Den bathymetriske udbredelse er 20—2435 fv. Fossil er den funden i Norge og Italien.

**Locality.** Stations 1, 9, 10, 79, and 149, the Sogne Fjord, and Husø (110 fathoms). Depth 100—650 fathoms.

*Syndesmya longicallis* is a deep-water form, common in the deep water of the fjords along the south coast of Norway and the west coast up to Lofoten. On the other hand, it is not found in Tromsø and Finmark. It extends southwards to the Mediterranean, the north-west coast of Africa, and the Azores. Upon the east coast of America, it range from New England to Brazil. Its bathymetrical distribution is from 20 to 2435 fathoms. It is a fossil in Norway and Italy.

**Tellina calcaria.** Chemnitz.

- Tellina calcaria*, Chemnitz, Conch. Cab., vol. 6, 1782, p. 140, Pl. 13, fig. 136.  
 — *lata*, Lovén, Ind. Moll. Scand., 1846, p. 41.  
 — *proxima*, Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 307, Pl. 21, fig. 1.  
*calcaria*, Römer, Mart. Chemn. Conch. Cab., vol. 10, part. 4, 1871, p. 222, Pl. 43, figs. 1—6.  
*Macoma* — G. O. Sars, Moll. Reg. Arct. Norw., 1878, p. 76, Pl. 6, fig. 2 a—b.

**Findested.** Stationerne 267, 270 og 273, Alten, 10—20 fv., Advent Bay, 20—40 fv. og Magdalena Bay, 30—60 fv. (unge exemplarer). Dybde 20—197 fv.

*Tellina calcaria* er en circumpolar art, som forekommer ved Grønland, Amerikas nord- og østkyst indtil Boston, Nordeuropa fra Færøerne og Østersøen (Bornholm og Kiel), Spitsbergen, Franz Josefs land, Barentshavet, Novaja Semlja, Karahavet, Sibirien, Beringshavet, Okotske hav og Japan. Den er meget almindelig ved vor nordkyst, ved vest- og sydkysten faaes den derimod sjelden levende. Ved de britiske kyster er den hidtil kun funden subfossil. Den bathymetriske udbredelse er 3—300 fv. Fossil er den funden i Skandinavien, nordlige Rusland, Britiske øer, Italien, Island, Nordamerika, Grønland, Sibirien og Spitsbergen.

**Locality.** Stations 267, 270, and 273, Alten (10—20 fathoms), Advent Bay (20—40 fathoms), and Magdalena Bay (30—60 fathoms; young specimens). Depth 20—197 fathoms.

*Tellina calcaria* is a circumpolar species, occurring off Greenland, the north coast of North America and the east coast down to Boston, in Northern Europe from the Faroe Isles and the Baltic (Bornholm and Kiel), Spitsbergen, Franz Josef Land, the Barents Sea, Novaja Semlja, the Kara Sea, off Siberia, in the Bering Sea, the Sea of Okhotsk, and Japan. It is very common off the north coast of Norway, while on the west and south coasts it is seldom found in the living state. Off the British coast, it has been found only in a sub-fossil condition. Its bathymetrical distribution is from 0 to 300 fathoms. It is a fossil in Scandinavia, northern Russia, the British Isles, Italy, Iceland, North America, Greenland, Siberia, and Spitsbergen.

**Tellina balthica,** Linné.

- Tellina balthica*, Linné, Syst. Nat., ed. 12, 1766, p. 1120.  
 — *solidula*, Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 304, Pl. 20, fig. 6.  
 — *balthica*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 375, Pl. 7, fig. 3, Pl. 40, fig. 5.  
*Macoma* — Römer, Mart. Chemn. Conch. Cab., vol. 10, part. 4, 1871, p. 217, Pl. 42, figs. 1—6.  
 — — G. O. Sars, Moll. Reg. Arct. Norw., 1878, p. 77.

**Findested.** Station 273, 197 fv., og station 357, 125 fv.

*Tellina balthica* er en circumpolar art, som er kjendt fra Grønland, Nordamerikas østkyst indtil Georgia, de europæiske kyster, Spitsbergen, Novaja Semlja, Sibirien, Beringshavet, Okotske hav, Japan og det nordvestlige Amerika. I Middelhavet gaar den helt ind til Sortehavet, i Østersøen til Den botniske bugt. Den forekommer langs hele den norske kyst, men er som oftest lokal. Hvor den paatræffes, optræder den i masser. Den bathymetriske udbredelse er 5—197 fv. Fossil er den funden i Skandinavien, nordlige Rusland, Tyskland, Britiske øer, Italien, Sibirien og Kanada.

**Locality.** Stations 273 (197 fathoms) and 357 (125 fathoms)

*Tellina balthica* is a circumpolar species, known in Greenland, on the east coast of North America down to Georgia, off the shores of Europe, Novaja Semlja, Siberia, in the Bering Sea, the Sea of Okhotsk, Japan, and north-western America. In the Mediterranean it extends as far as the Black Sea, and in the Baltic to the Gulf of Bothnia. It occurs all along the Norwegian coast, but as a rule is local. Wherever it occurs, it is found in numbers. Its bathymetrical distribution is from 5 to 197 fathoms. It is a fossil in Scandinavia, the north of Russia, Germany, the British Isles, Italy, Siberia, and Canada.

**Tellina** sp.

Paa station 200, 620 fv., forekom en liden 1.5 mm. lang bivalv, som vi maa henføre til *tellina*, men vi kan ikke med sikkerhed gjenkjende den som en af vore kjendte arter og da den med al sandsynlighed er et ungstadium vover vi ikke at opføre den som ny for videnskaben.

At Station 200 (620 fathoms) a small bivalve was found (1.5 mm.), which we must refer to the genus *Tellina* but we cannot recognize in it any of the well known species. As it probably an immature specimen, we will not venture to give it a new name.

**Asbjørnsenia striata**, Friele.

*Asbjørnsenia striata*, Friele, Nordhavsemp. Moll., vol. 2, 1886, p. 36, Pl. 12, fig. 14 a—b.

*Asbjørnsenia striata* foreligger kun i et dødt, men vel vedligeholdt exemplar fra station 173 b, 300 fv.

There is only one, dead, but well preserved, specimen of *Asbjørnsenia striata*, from Station 173 b (300 fathoms).

**Mactra gallina**, Da Costa.

*Trigonella gallina*, Da Costa, Brit. Conch., 1778, p. 199, Pl. 14, fig. 6.

*Mactra elliptica*, Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 356, Pl. 22, fig. 3, Pl. L, fig. 1.

— *solida*, var. *elliptica*, Jeffreys, Brit. Conch., vol. 2, 1863, p. 417, Pl. 43, fig. 2 a.

— *elliptica*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 72.

— *solida*, var. *elliptica*, Weinkauff, Mart. Chemn. Conch. Cab., vol. 11, part. 2, 1884, p. 73, Pl. 25, fig. 5.

**Findested.** Tromsø, station 51, 1163 fv., (døde skaller) og station 173 b, 300 fv.

*Mactra gallina* er en østatlantisk art, som er udbredt fra Murmankysten, Finmarken og Island til Portugal og Spanien (Cadiz). Den forekommer almindelig langs hele den norske kyst paa 5—100 favnes dyb, forøvrigt gaar den ned til 300 fv. Fossil er den funden over en større del af Europa.

**Locality.** Tromsø, Stations 51 (1163 fathoms) (dead shells), and 173 b (300 fathoms).

*Mactra gallina* is an east-Atlantic species, ranging from the Murman Coast, Finmark, and Iceland, to Portugal and Spain (Cadiz). It is common all along the Norwegian coast, in depths of from 5 to 100 fathoms, but occurs down to 300 fathoms. It is found as a fossil in many parts of Europe.

**Kennerlia glacialis**, Leach.

*Pandora glacialis*, Leach, Voy. Discov. Ross, App. no. 4, 1819, p. 174.

*Kennerlia* — Carpenter, Proc. Zool. Soc., 1864, p. 603.

*Pandora* — Leche, Kgl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 11, Pl. 1, fig. 1 a—b.

**Findested.** Fair Harbour og Norskoerne, (Spitsbergen), 10—30 fv. Kun tre exemplarer, det største exemplar var 30 mm. langt og 18 mm. bredt.

*Kennerlia glacialis* er en circumpolar arktisk art, som er kjendt fra Baffinsbugten, Nordamerikas østkyst indtil New England<sup>1)</sup>, Spitsbergen, Franz Josefs land, Murmankysten, Hvidehavet, Novaja Semlja, Karahavet, Sibirien og Beringshavet. Mærkelig nok er den ikke tagen ved Grønland. Jeffreys slaar den sammen med den sydligere optrædende *kennerlia (pandora) inæquivalis* (Proc. Zool. Soc. 1881, p. 929), men kan vi ikke samstemme heri. Den bathymetriske udbredelse er 2—100 fv. Fossil er den ifølge Knipowitsch funden ved Dwina.

**Locality.** Fair Harbour, and the Norwegian Islands, (Spitsbergen) (10—30 fathoms). Only three specimens. The largest being 30 mm. long and 18 mm. broad.

*Kennerlia glacialis* is a circumpolar arctic species, known in Baffin Bay, off the east coast of North America down to New England<sup>1)</sup>, Spitsbergen, Franz Josef Land, the Murman Coast, in the White Sea, Novaja Semlja, the Kara Sea, Siberia, and the Bering Sea. Strange to say, it has not been found in Greenland. Jeffreys believes it to be synonymous with the more southern species, *Kennerlia (Pandora) inæquivalis*, (Proc. Zool. Soc. 1881, p. 929), but we do not agree with him in this. Its bathymetrical distribution is from 2 to 100 fathoms. According to Knipowitsch, it is found as a fossil near the Dwina.

<sup>1)</sup> Ifølge Dall skal den endog gaa helt med til Floridastrædet. Den sydligere form er senere af Verrill og Bush bleven udskilt og beskrevet under navnet *kennerlia brevis* (Proc. U. S. Nat. Museum, vol. 2, 1898, p. 821, tab. 88, fig. 7 a—b).

<sup>1)</sup> According to Dall, it is even found as far south as the Florida Channel. The more southern form has since been separated and described by Verrill and Bush under the name *Kennerlia brevis*, (Proc. U. S. Nat. Museum, Vol. XX, 1898, p. 821, Pl. LXXXVIII, fig. 7 a, b)



**Neæra obesa**, Lovén.*Neæra obesa*, Lovén, Ind. Moll. Scand., 1846, p. 48.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 86, Pl. 6, fig. 4 a—c.

**Findsted.** Husø 100 fv. og stationerne 2, 10, 79, 101, 149, 175. Dybde 100—672 fv.

Denne art er kjendt fra Spitsbergen og Karahavet til Azorerne, Nordafrikas vestkyst og Middelhavet og fra Grønland til Den mexikanske golf. Den bathymetriske udbredelse er 20—1495 fv.

**Locality.** Husø (100 fathoms), Stations 2, 10, 79, 101, 149, and 175. Depth 100—672 fathoms.

This species is known from Spitsbergen and the Kara Sea to the Azores, the north-west coast of Africa, and the Mediterranean, and from Greenland to the Gulf of Mexico. Its bathymetrical distribution is from 20 to 1495 fathoms.

**Neæra obesa** var. **glacialis**, G. O. Sars.*Neæra glacialis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 88, Pl. 6, fig. 8 a—c.— *obesa* var. *glacialis*, Friele, Jahrb. Deutsch Malacozool. Gesellsch., vol. 6, 1879, p. 270.— *glacialis*, Verrill, Trans. Connecticut Acad., vol. 5, 1882, p. 562, Pl. 44, fig. 10 a—b.**Findested.** Stationerne 257, 260, 261, 336 og 357. Dybde 70—160 fv.

*Neæra glacialis*, Sars, kan neppe betragtes som andet end en kjæmpemæssig form af *neæra obesa*, Lovén, der i de arktiske farvande har naaet sin største udvikling. Unge exemplarer af *glacialis* kan ikke adskilles fra ligestore af *obesa*. Posselt henfører ligeledes *neæra arctica* til *obesa* hvad forøvrigt Verrill ogsaa synes tilboielig til, men heri er vi ikke enige. Derimod viser *neæra arctica* større overensstemmelse med den sydligere, europæiske *cuspidata*. Vi skulde derfor i lighed med Whiteaves være mest tilboielig til at betragte den som en varietet af denne. Med Whiteaves kan vi imidlertid ikke samstemme, naar han betragter *obesa* som unge af *cuspidata*.

*Neæra obesa* var. *glacialis* er kjendt fra Novaja Semlja, Karahavet, Sibirien, Spitsbergen, Finmarken, Grønland og Nordamerikas østkyst indtil Den mexikanske golf. Den bathymetriske udbredelse er 36—1467 fv.

**Locality.** Stations 257, 260, 261, 336, and 357. Depth 70—160 fathoms

*Neæra glacialis*, Sars, can scarcely be regarded as more than a gigantic form of *Neæra obesa*, Lovén, that has attained its highest development in arctic waters. Young specimens of *glacialis* are not distinguishable from *obesa* of the same size. Posselt also unites *Neæra arctica* and *obesa*, and Verrill seems inclined to do the same, but we do not agree with them. On the other hand, *Neæra arctica* shows a greater relation to the more southern European *cuspidata*. Like Whiteaves, we should therefore be most inclined to regard it as a variety of that form; but we cannot agree with him in regarding *obesa* as the young of *cuspidata*.

*Neæra obesa* var. *glacialis* occurs off Novaja Semlja, the Kara Sea, Siberia, Spitsbergen, Finmark, Greenland and off the east coast of North America down to the Gulf of Mexico. Its bathymetrical distribution is from 36 to 1467 fathoms.

**Neæra arctica**, M. Sars.*Neæra arctica*, M. Sars, Christiania Vid. Selsk. Forhandl., 1858, p. 62.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 85, Pl. 6, fig. 5 a—c.

**Findested.** Stationerne 124 (fragmenter), 192, 200, 223, 224, 267, 290, 323 og 357. Dybde 70—649 fv.

*Neæra arctica* er tidligere kjendt fra Grønland, Nova Scotia, Sibirien, Karahavet, Murmankysten, Spitsbergen og Finmarken, hvor den dog blot er funden paa en lokalitet, Vadsø. Den bathymetriske udbredelse er 60—650 fv.

**Locality.** Stations 124 (fragments), 192, 200, 223, 224, 267, 290, 323, and 357. Depth 70—649 fathoms.

*Neæra arctica* has been found off Greenland, Nova Scotia, Siberia, in the Kara Sea, off the Murman Coast, Spitsbergen, and Finmark, where occurs it in only one locality, namely Vadsø. Its bathymetrical distribution is from 60 to 650 fathoms.

***Neæra exigua*, Jeffreys.**

*Neæra exigua*, Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 18, 1876, p. 496.

— Friele, Jahrb. Deutsch Malacozool. Gesellsch., vol. 6, 1879, p. 270.

**Findested.** Stationerne 18, 31, 87, 124, 164, 200, 240, 251, 283, 312. Dybde 350—1004 fv.

De største exemplarer var 8.5 mm. lang, 4.5 mm. høj.

Denne ægte dybrandsform, der staar mellem *neæra obesa* og *neæra subtorta*, er tidligere kun funden af Valorous-expeditionen sydost af Kap Farvel paa 1450 favnes dyb. Denne lokalitet tilhører den varme area, medens samtlige stationer fra Nordhavsexpeditionen ligger inden den kolde.

**Locality.** Stations 18, 31, 87, 124, 164, 200, 240, 251, 283, and 312. Depth 350—1004 fathoms.

The largest specimens were 8.5 mm. in length, and 4.5 mm. in height.

This true deep-water form, which stands between *N. obesa* and *N. subtorta*, had previously been found only by the Valorous Expedition to the SE of Cape Farewell, at a depth of 1450 fathoms. This locality belongs to the warm area, while all the stations of the North Atlantic Expedition are in the cold area.

***Neæra subtorta*, G. O. Sars.**

*Neæra subtorta*, G. O. Sars, (m. s.), Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 20, 1877, p. 234.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 87, Pl. 6, fig. 6 a—c.

**Findested.** Stationerne 48, 260, 261, 267, 270, 273, 290, 323, 326 og 336. Dybde 70—299 fv.

Denne art, der forekommer langs vor nordkyst<sup>1)</sup> er kjendt fra Karahavet, Novaja Semlja, Spitsbergen, Murmankysten, nordlige Atlanterhav og kysten af Maine. Den bathymetriske udbredelse er 30—550 fv. Fossil er den blot funden paa Grønland.

**Locality.** Stations 48, 260, 261, 267, 270, 273, 290, 323, 326, and 336. Depth 70—299 fathoms.

This species which occurs along the north coast of Norway<sup>1)</sup> has been found in the Kara Sea, Novaja Semlja, Spitsbergen, off the Murman Coast, in the North Atlantic, and off the coast of Maine. Its bathymetrical distribution is from 30 to 550 fathoms. It is a fossil only in Greenland.

***Neæra rostrata*, Spengler.**

*Mya rostrata*, Spengler, Skrift. naturhist. Selsk., vol. 3, 1792, p. 42, Pl. 2, fig. 16.

*Neæra* — Lovén, Ind. Moll. Scand., 1846, p. 47.

Jeffreys, Brit. Conch., vol. 3, 1865, p. 51, Pl. 49, fig. 3.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 89, Pl. 6, fig. 7 a—b.

**Findested.** Husø 100 fv., station 149, 135 fv. og station 255, 341 fv.

*Neæra rostrata* er paa den europæiske side af Atlanterhavet, udbredt fra Fimarken, og Færøerne til Azorerne, Kanariske øer og Marocos vestkyst. Paa den amerikanske side forekommer den fra New England til Barbados og Den mexikanske golf. Jeffreys anfører den desuden fra Patagonien, men er denne muligens den nærstaaende *neæra patagonica*, Smith, som Challenger-expeditionen først fandt ved Patagoniens vestkyst og som senere er tagen ved saavel Sydamerikas vest- som østkyst. Den bathymetriske udbredelse er 10—1456 fv. Fossil er den kjendt fra Tyskland og Italien.

**Locality.** Husø (100 fathoms), Station 149 (135 fathoms) and 205 (341 fathoms).

On the European side of the Atlantic *Neæra rostrata* is distributed from Finmark and the Faroe Isles to the Azores, the Canary Isles, and the west coast of Morocco. On the American side, its range is from New England to Barbadoes and the Gulf of Mexico. Jeffreys also records its occurrence in Patagonia, but this is possibly the nearly-related *N. patagonica*, Smith, which the Challenger Expedition first found off the west coast of Patagonia, and which has since been found both on the west and east coasts of South America. Its bathymetrical distribution is from 10 to 1456 fathoms. It is a fossil in Germany and Italy.

<sup>1)</sup> Sars angiver *neæra subtorta* fra Bergen efter opgave fra Jeffreys. Vi tror her er en misforstaaelse tilstede, thi os bekjendt er den ikke funden saa langt syd.

<sup>1)</sup> Sars records *N. subtorta* from Bergen on the authority of Jeffreys. We fear here must be some misunderstanding; for aught we know this species has not been found so far south.

**Neæra abbreviata, Forbes.**

*Neæra abbreviata*, Forbes, Proc. Zool. Soc., 1843, p. 75.

*vitrea*, Lovén, Ind. Moll. Scand., 1846, p. 48.

— *abbreviata*, Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 201, Pl. 7, fig. 7.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 48, Pl. 49, fig. 1.

G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 89.

*Neæra abbreviata* foreligger kun fra Sognefjord, 100 fv. Den hører hjemme i Middelhavet, Egæerhavet og det østlige af Atlanterhavet, hvor den er udbredt fra Marocos vestkyst til Shetlandsøerne og Norge. Ved vore kyster forekommer den fra Christianiafjorden til Lofoten, dog er den ikke meget talrig. Den bathymetriske udbredelse er 30—718 fv. Fossil er den kjendt fra Belgien, Frankrig og Italien.

*Neæra abbreviata* was found only in the Sogne Fjord (100 fathoms). It is a native of the Mediterranean, the Ægean Sea, and the east of the Atlantic Ocean, where its range is from the coast of Morocco to the Shetland Isles and Norway. In the last-named country, it occurs from the Christiania Fjord to Lofoten, though not in large numbers. Its bathymetrical distribution is from 30 to 718 fathoms. It is a fossil in Belgium, France and Italy.

**Neæra costellata, Deshayes.**

*Corbulu costellata*, Deshayes, Exp. Sci. Morée, 1830, p. 86, Pl. 7, fig. 1—3.

*Neæra sulcata*, Lovén, Ind. Moll. Scand., 1846, p. 48.

— *costellata*, Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 199, Pl. 7, figs. 8—9, Pl. G, fig. 8, 9.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 49, Pl. 49, fig. 3.

Denne art fandtes kun ved Husø, 40 fv. Den er udbredt langs vor syd- og vestkyst i det mindste til Trondhjemsfjorden. Forøvrigt er den kjendt fra Middelhavet, Adriaterhavet, Egæerhavet og det nordlige af Atlanterhavet fra Færøerne til Madeira, Azorerne og Kanariske øer og fra Cape Hatteras til Den mexikanske golf og Antillerne. Den bathymetriske udbredelse er 2—1060 fv. Fossil er den funden i Belgien, Frankrig, Italien og Grækenland.

This species was found only at Husø (40 fathoms). It is distributed along the south coast of Norway and the west coast at least as far north as the Trondhjem Fjord. It also occurs in the Mediterranean, the Adriatic, and the Ægean Sea, and in the North Atlantic from the Faroe Isles to Madeira, the Azores, and the Canary Isles, and from Cape Hatteras to the Gulf of Mexico and the Antilles. Its bathymetrical distribution is from 2 to 1060 fathoms. It is fossil in Belgium, France, Italy, and Greece.

**Neæra striata, Jeffreys.**

*Neæra striata*, Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 18, 1876, p. 495.

— — Jeffreys, Proc. Zool. Soc., 1881, p. 944, Pl. 71, fig. 11.

— *multicostata*, Verrill, Trans. Connecticut Acad., vol. 5, 1882, p. 559, Pl. 58, fig. 40.

*Cuspidaria striata*, Locard, Exp. Sci. Travailleux & Talisman, Moll. Test., vol. 2, 1898, p. 190, fig. 18—23.

Af denne art foreligger kun et større fragment fra station 290, 191 fv.

*Neæra striata* blev først funden af „Valorous“ i det nordlige af Atlanterhavet, 690—1450 fv. Senere har „Knight Errant“ og „Lightning“ den fra Færokanalen, 220—510 fv. „Porcupine“ fra Irlands vestkyst, 420—630 fv., „Travailleux“ fra Biskayerbugten, 540—720 fv., „Talisman“ fra kysten af Maroco, 130—250 fv. og „Josefine“ fra Azorerne, 190—680 fv. Paa den amerikanske side er den kjendt fra en række stationer mellem Massachusetts og Den mexi-

There is only one rather large fragment of this species, found at Station 290 (191 fathoms).

*Neæra striata* was first found by the 'Valorous' in the North Atlantic (690—1450 fathoms). It has since been found by the 'Knight-Errant' and the 'Lightning' in the Faroe Channel (220—510 fathoms), by the 'Porcupine' off the west coast of Ireland (420—630 fathoms), by the 'Travailleux' in the Bay of Biscay (540—720 fathoms), by the 'Talisman' off the coast of Morocco (130—250 fathoms), and by the 'Josephine' off the Azores (190—680 fathoms).



kanske golf, 85—158 fv., endvidere har „Albatross“ faaet den ved Rio Janeiro, 57 fv.

On the American side of the Atlantic, it has been found at a number of stations between Massachusetts and the Gulf of Mexico (85—158 fathoms); and lastly, the 'Albatross' found it at Rio de Janeiro (57 fathoms).

#### *Neæra lamellosa*, M. Sars.

*Neæra lamellosa*, M. Sars, Christiania Vid. Selsk. Forhandl., 1858, p. 62.

*jugosa*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 88, Pl. 6, fig. 9 a—c.

**Findested.** Stationerne 9, 10, 101, 149, 195, 255, 260 og 290. Dybde 107—341 fv.

Vi har havt anledning til at sammenligne den ved vor kyst forekommende form med et exemplar af S. V. Woods *neæra jugosa* fra Englands coralline crag. Saavel skallets konturer som dets striering er saa forskjellig, at vi maa være enig med Jeffreys, naar han anser den recente form for en distinct art, der er forskjellig fra *neæra jugosa*, Wood. Dalls *neæra lamellosa* i Bull. U. S. Nat. Museum no. 37, 1889, tab. 45, fig. 3, synes ikke at være Sars's art.

*Neæra lamellosa* er ret almindelig paa de større dyb langs vor vestkyst op til Vestfinmarken. Forøvrigt forekommer den i det nordlige af Atlanterhavet fra Færøerne til Middelhavet og fra Marthas Vineyard til Maryland. Den bathymetriske udbredelse er 50—690 fv. Fossil er den funden i Italien.

**Locality.** Stations 9, 10, 101, 149, 195, 255, 260, and 290. Depth 107—341 fathoms.

We have had an opportunity of comparing the form occurring on the coast of Norway with a specimen of S. V. Wood's *N. jugosa* from the English coralline crag. Both the form and the striation are so different, that we must agree with Jeffreys in regarding the recent form as a distinct species differing from *N. jugosa*, Wood. Dall's *N. lamellosa*, in Bull. U. S. Nat. Museum, No. 37, 1889, (Pl. XLV, fig. 3), does not appear to be Sars's species.

*Neæra lamellosa* is rather common in the deep water along the west coast of Norway up to west Finmark. It occurs further in the North Atlantic from the Faroe Isles to the Mediterranean, and from Martha's Vineyard to Maryland. Its bathymetrical distribution is from 50 to 690 fathoms. It is found as a fossil in Italy.

#### *Poromya granulata*, Nyst & Westendorp.

*Corbula granulata*, Nyst & Westendorp, Nouv. Rech. Coqu. foss. d. Anvers, 1839, p. 6, no. 10, Pl. 3, fig. 3.

*Embla koreni*, Lovén, Ind. Moll. Scand., 1846, p. 46.

*Poromya granulata*, Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 204, Pl. 9, figs. 4—6.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 45, Pl. 2, fig. 3, vol. 5, p. 191, Pl. 49, fig. 1.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 90, Pl. 5, fig. 6 a—b.

**Findested.** Stationerne 192, 260, 261 og 290. Dybde 127—649 fv.

Det største exemplar var 11 mm. lang, 16 mm. høi.

Ved den norske kyst forekommer denne art mere eller mindre sparsomt fra Stavanger til Porsangerfjorden. Forøvrigt er den udbredt fra Murmankysten til Madeira, Marocos vestkyst og Middelhavet. Endvidere forekommer den langs Amerikas østkyst fra New England og Maine til Barbados og Den mexikanske golf. Den bathymetriske udbredelse er 20—650 fv. Fossil er den funden i Frankrig, Belgien og Italien.

**Locality.** Stations 192, 260, 261, and 290. Depth 127—649 fathoms.

The largest specimen was 11 mm. in length, and 16 mm. in height.

This species occurs more or less sparsely on the Norwegian coast from Stavanger to the Porsanger Fjord. It is distributed from the Murman Coast to Madeira, the west coast of Morocco, and the Mediterranean; and on the east coast of North America from New England and Maine to Barbadoes and the Gulf of Mexico. Its bathymetrical distribution is from 20 to 650 fathoms. It is a fossil in France, Belgium and Italy.

***Thracia truncata*, Turton.**

*Anatina truncata*, Turton, Conch. Brit., 1822, p. 46, Pl. 4, fig. 6.

*Thracia myopsis*, Gould & Binney, Rep. Invert. Mass., ed. 2, 1870, p. 71.

— *truncata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 84, Pl. L, figs. 10—11.

**Findested.** Stationerne 261, 262, 273, 290, 326, 336, 338, 357, Hammerfest, 20 fv., og Jan Mayen, 10—15 fv. Dybde 10—197 fv. Exemplaret fra sidstnævnte lokalitet var 33 mm. langt og 26 mm. høit. Et exemplar fra station 261, som udmerkede sig ved sin langstrakte form, maalte henholdsvis 36 mm. og 24 mm.

*Thracia truncata*, der er ret almindelig ved vor arktiske kyst, gaar mod syd til Bergen, hvor den dog neppe opnaar den halve størrelse af, hvad den gjør i de arktiske egne. Arten er forøvrigt kjendt fra Grønland, Nordamerikas østkyst indtil Massachusetts, Færøerne, Island, Jan Mayen, Spitsbergen, Murmankysten, Hvidehavet, Novaja Semlja og Karahavet. Den bathymetriske udbredelse er 5—197 fv. Fossil er den kjendt fra Norge, nordlige Rusland, Spitsbergen og Kanada.

**Locality.** Stations 261, 262, 273, 290, 326, 336, 338, and 357, Hammerfest (20 fathoms), and Jan Mayen Island (10—15 fathoms). The specimen from Jan Mayen was 33 mm. long, and 26 mm. high. A specimen from Station 261, that was remarkable for its elongated form, measured 36 and 24 mm. in length and height respectively.

*Thracia truncata*, which is quite common on the arctic coast of Norway, extends southwards as far as Bergen, where, however, it scarcely attains half the size that it does in the arctic regions. The species also occurs off Greenland, the east coast of North America down to Massachusetts, the Faroe Isles, Iceland, Jan Mayen, Spitsbergen, the Murman Coast, in the White Sea, Novaja Semlja, and the Kara Sea. Its bathymetrical distribution is from 5 to 197 fathoms. It is a fossil in Norway, northern Russia, Spitsbergen, and Canada.

***Thracia septentrionalis*, Jeffreys.**

*Thracia septentrionalis*, Jeffreys, Ann. & Mag. Nat. Hist., ser. 4, vol. 10, 1872, p. 238.

— *crassa*, Becher, Österreich. Polarstation Jan Mayen, Bd. 3, 1886, p. 71, Pl. 6, fig. 1.

**Findested.** Jan Mayen, 10—15 fv., Norskøerne og Spitsbergen, 10—20 fv. De fleste men ikke alle af exemplarerne fra Jan Mayen var forholdsvis kortere og mere tykskallede end dem fra Spitsbergen. Det er denne tykskallede form, Becher har beskrevet under navnet *thracia crassa*. Det største exemplar var 31 mm. lang, 24 mm. hoi.

Foruden fra Jan Mayen og Spitsbergen er denne art blot kjendt fra Grønlands vestkyst, Murmankysten, Maine og Massachusetts, U. S. A. Den bathymetriske udbredelse er 10—70 fv.

**Locality.** Jan Mayen (10—15 fathoms), the Norwegian Islands, and Spitsbergen (10—20 fathoms). The greater number of the specimens from Jan Mayen were comparatively shorter and had thicker shells than those from Spitsbergen. It is this thick-shelled form that Becker has described under the name *Thracia crassa*. The largest specimen measured 31 mm. in length, and 24 mm. in height.

In addition to Jan Mayen and Spitsbergen, this species is only known off the west coast of Greenland, the Murman Coast, Maine and Massachusetts. Its bathymetrical distribution is from 10 to 70 fathoms.

***Lyonsia arenosa*, Møller.**

*Pandorina arenosa*, Møller, Ind. Moll. Grønl., 1842, p. 20.

*Lyonsia norvegica*, Middendorf, Sibir. Reise, vol. 2, part 1, 1851, p. 264, Pl. 24, fig. 8—11.

— *arenosa*, Gould & Binney, Rep. Invert. Mass., ed. 2, 1870, p. 65.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 81 og p. 342, Pl. 33, fig. 2 a—b.

Denne art fandtes ved Tromsø, 10—20 fv. og ved station 353. 1333 fv.

Dens eneste med sikkerhed kjendte findested ved den norske kyst er Tromsø. Dens forekomst ved syd- og vestkysten er usikker.

This species was found at Tromsø (10—20 fathoms), and at Station 353 (1333 fathoms).

The only place off the Norwegian coast where this species is known to be found is Tromsø. Its occurrence off the west and south coasts is uncertain.

Den er en circumpolar art, som forekommer ved Grønland, Amerikas nord- og østkyst, Jan Mayen, Island, Spitsbergen, Murmankysten, Hvidehavet, Novaja Semlja, Karahavet, Sibirien, Okotske hav. Den bathymetriske udbredelse er 2—120 fv. Til ovennævnte dybdeangivelse fra station 353, 1333 fv., kan der vanskelig tages hensyn, da den staar i strid med alle tidligere observationer, desuden erholdtes arten paa denne lokalitet kun i et meget beskedigt skal. Fossil er den kjendt fra Sverige og det nordlige Rusland.

It is a circumpolar species, occurring off Greenland, the north and east coasts of North America, Jan Mayen, Iceland, Spitsbergen, the Murman Coast, in the White Sea, Novaja Semlja, the Kara Sea, Siberia, and the Sea of Okhotsk. Its bathymetrical distribution is from 2 to 120 fathoms. It is hardly possible to pay any regard to the above statement of the depth at Station 353 — 1333 fathoms — as it is at variance with all previous observations, and moreover, the species was represented in this locality by only one large fragment. It as fossil in Sweden and the north of Russia.

#### **Lyonsiella abyssicola, M. Sars.**

*Lyonsiella abyssicola*, M. Sars, Christiania Vidensk. Selsk. Forhandl., 1866, p. 257.

*Pecchiolia* — G. O. Sars, Rem. forms anim. life, vol. 1, 1872, p. 25, Pl. 3, fig. 21 43

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 82, Pl. 20, fig. 5 a—d.

*Cardium fragile*, van Haren Norman, *Lamellibranch.* „Willem Barents“, 1882, p. 9, Pl. 2, fig. 26—28.

**Findested.** Stationerne 124, 192, 248, 251, 290, 312 og 323. Dybde 191—778 fv. Exemplarerne fra station 312 udmerkede sig ved sin usædvanlige størrelse. Sars angiver denne arts længde til 5 mm., disse var derimod indtil 9 mm. lang.

*Lyonsiella abyssicola* er tidligere kjendt fra Baffinsbugten, Grønlands vestkyst, New England, Spitsbergen, Barentshavet, Hvidehavet, Norges nord- og vestkyst, Irlands vestkyst, Kanalen og Portugal. Den bathymetriske udbredelse er 90—1095 fv.

**Locality.** Stations 124, 192, 248, 251, 290, 312, and 323. Depth 191—778 fathoms. The specimens from Station 312 were remarkable for their unusual size. Sars gives the length of this species as 5 mm., whereas these were as much as 9 mm. in length.

*Lyonsiella abyssicola* is known in Baffin's Bay, off the west coast of Greenland, New England, Spitsbergen, the Barents Sea, the White Sea, off the north and west coasts of Norway, the west coast of Ireland, in the English Channel and Portugal. Its bathymetrical distribution is from 90 to 1095 fathoms.

#### **Lyonsiella jeffreysi, Friele.**

*Lyonsiella jeffreysi*, Friele, Jahrb. Deutsch. Malacozool. Gesellsch., vol. 6, 1879, p. 269.

— — Friele, Nordhavsexp. Moll., vol. 2, 1886, p. 38, Pl. 12, fig. 15 og 16.

*Lyonsiella jeffreysi* foreligger i to store velbevarede høire skaller og nogle fragmenter fra station 295, 1100 fv. og den øvre del af en høire skal fra station 312, 656 fv. Arten er endnu ikke iagttaget udenfor Spitsbergens omraadet.

There are two large, well-preserved right valves of *Lyonsiella jeffreysi*, and some fragments from Station 295 (1100 fathoms), and the upper part of a right valve from Station 312 (656 fathoms). The species has not yet been observed elsewhere than off Spitsbergen.



**Panopæa norvegica**, Spengler.

- Mya norvegica*, Spengler, Skr. Naturhist. Selsk., vol. 3, 1792, p. 46, Pl. 2, fig. 18.  
*Panopæa* Middendorff, Beitr. Malac. Ross., part 3, 1851, p. 77, Pl. 20, fig. 11.  
 — *arctica*, Gould & Binney, Rep. Invert. Mass., ed. 2, 1870, p. 51.  
 — *norvegica*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 94, Pl. 6, fig. 12 a—b.

**Findested.** Døde skaller fandtes paa station 261, Tanafjord, 120 fv. og station 326, 123 fv.

*Panopæa norvegica* vides kun to gange tagen levende ved den norske kyst, af G. O. Sars i Lofoten og af Aurivillius i Kvænangen. Forøvrigt er den kun af og til funden subfossil ved vor nord- og vestkyst. Den er en circumpolar art, som er kjendt fra Nordeuropa indtil Shetlandsøerne, Northumberland, Doggerbank, Skagerak og Kattegat. Inden de danske farvande skal det dog ifølge Petersen være tvivlsomt, om den mere forekommer levende. Endvidere er den kjendt fra Okotske hav og Amerikas nordkyst fra Beringsstrædet til New Foundland; ved Massachusetts er den funden subfossil. Fossil er den kjendt fra saavel de ældre som nyere glaciæle afleiringer i Norge, samt fra Sicilien, Britiske øer, nordlige Rusland og Grønland, hvor den endnu ikke er tagen levende, skjønt den ifølge Woodward lever i Baffinsbugten. Den bathymetriske udbredelse er 25—300 fv.

**Locality.** Empty shells were found at Station 261, Tana Fjord (120 fathoms), and Station 326 (123 fathoms).

*Panopæa norvegica* has only been found alive off the Norwegian coast on two occasions — by G. O. Sars in Lofoten, and by Aurivillius in Kvænangen; otherwise it is only found sub-fossil now and then off the north and west coasts. It is a circumpolar species, known from the north of Europe down to the Shetland Isles, in Northumberland, on the Dogger Bank, in the Skagerak and the Kattegat. In Danish waters, however, according to Petersen, it is doubtful whether it occurs any longer in a living state. It also occurs in the Sea of Okhotsk and off the north coast of North America from Bering Straits to Newfoundland. It is found sub-fossil off Massachusetts. As a fossil, it is known in both the earlier and the later glacial deposits in Norway, as well as in Sicily, the British Isles, northern Russia, and Greenland. In the last-named country it has not yet been found alive, although, according to Woodward, it lives in Baffin's Bay. Its bathymetrical distribution is from 25 to 300 fathoms.

**Cyrtodaria siliqua**, Spengler.

- Mya siliqua*, Spengler, Skr. Naturhist. Selsk., vol. 3, 1792, p. 48.  
*Cyrtodaria kurriana*, Dunker, Malak. Blätter, 1862, p. 38.  
*Glycimeris siliqua*, Gould & Binney, Rep. Invert. Mass., ed. 2, 1870, p. 53, fig. 374.

Denne art foreligger kun i to større og flere mindre eksemplarer fra Jan Mayen, 10—30 fv. De større eksemplarer, der var henholdsvis 25 og 38 mm. lang, tilhører formen *siliqua*, medens de mindre stemmer mere overens med den af Dunker beskrevne *kurriana*.

*Cyrtodaria siliqua* er en høiarktisk circumpolar art, som er kjendt fra Grønland, New Foundland, Nova Scotia, Spitsbergen, Novaja Semlja, Karahavet, Sibirien, Beringshavet og Aleuterne. Den bathymetriske udbredelse er 2—30 fv. Fossil er den funden paa Grønland og Island.

Of this species, there are only two large, and several small specimens from Jan Mayen (10—30 fathoms). The large specimens, which are respectively 25 and 38 mm. in length, belong to the form *siliqua*, while the smaller ones correspond more closely with the form *kurriani*, described by Dunker.

*Cyrtodaria siliqua* is a high-arctic, circumpolar species, known in Greenland, Newfoundland, Nova Scotia, Spitsbergen, Novaja Semlja, the Kara Sea, Siberia, the Bering Sea, and the Aleutian Isles. Its bathymetrical distribution is from 2 to 30 fathoms. It is fossil in Greenland and Iceland.

**Saxicava arctica**, Linné.

*Mya arctica*, Linné, Syst. Nat., ed. 12, 1766, p. 1113.

*Saxicava* — d'Orbigny, Moll. Canaries, 1834, p. 100.

— — & *rugosa*, Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 141 og 146, Pl. 6. fig. 4—8, Pl. F, fig. 6.

— *rugosa*, Jeffreys, Brit. Conch., vol. 3, 1865, p. 81, Pl. 3. fig. 3. Pl. 51, figs. 3 og 4.

— *pholadis* & *arctica*, G. O. Sars, Moll. Reg. Arct. Norv. 1878, p. 95, Pl. 20, fig. 7 a—c. 8 a—c.

**Findested.** Stationerne 261, 267, 280, 290, 312 || (døde skaller), 322, Husø, Bodø, Magdalena Bay, Advent Bay og Norskøerne, 10—40 fv. Dybde 10—191 fv. (658 fv.).

Exemplarerne tilhører dels den kantede og ofte tornede form *arctica*, dels ogsaa den glatte afrundede *rugosa* s. *pholadis*. De største exemplarer maalte indtil 36 mm., et skal fra station 280 var endog 45 mm. langt.

*Saxicava arctica* er en kosmopolitisk art, som er funden saavel i den nordlige som den sydlige hemisfæres have. Den bathymetriske udbredelse er 0—1622 fv. Fossil er den kjendt fra Grønland, Spitsbergen og en større del af Europa, Nordamerika og det nordlige Asien.

**Locality.** Stations 261, 267, 280, 290, 312 (dead shels), and 322, Husø, Bodo, Magdalena Bay, Advent Bay, and the Norwegian Islands (10—40 fathoms). Depth 10—191 fathoms (658 fathoms).

Some of the specimens belong to the angular and often spiny form, *arctica*, some to the smoothly rounded *rugosa* s. *pholadis*. The largest measured as much as 36 mm., and one valve from Station 280 was no less than 45 mm. in length.

*Saxicava arctica* is a cosmopolitan species, found in the waters of both the northern and the southern hemisphere. Its bathymetrical distribution is from 0 to 1622 fathoms. It is a fossil in Greenland, Spitsbergen, and many parts of Europe, North America, and northern Asia.

**Arcinella plicata**, Montagu.

*Mytilus plicatus*, Montagu, Test. Brit. Suppl., 1808, p. 10.

*Panopea plicata*, Jeffreys, Brit. Conch., vol. 3, 1865, p. 75, Pl. 3, fig. 2.

*Arcinella* G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 93, Pl. 20, fig. 6 a—c.

Denne art foreligger kun i et par exemplarer fra station 255, Vestfjorden, 341 fv. Den forekommer langs hele vor syd- og vestkyst op til Lofoten. Endvidere er den kjendt fra de Britiske øer, Middelhavet, Nordafrikas vestkyst, Kanariske øer og Korea. Den bathymetriske udbredelse er 5—628 fv. Fossil er *arcinella plicata* funden ved Cassel og Belfast, samt i Belgien og Italien.

There are only a few specimens of this species from Station 255, West Fjord (341 fathoms). It occurs all along the south and west coasts of Norway, as far north as Lofoten, and is further reported from the British Isles, the Mediterranean, the north-west coast of Africa, the Canary Isles, and the Corea. Its bathymetrical distribution is from 5 to 628 fathoms. It is found as a fossil at Cassel and Belfast, and in Belgium and Italy.

**Mya truncata**, Linné.

*Mya truncata*, Linné, Syst. Nat., ed. 12, 1766, p. 1112.

— — Forbes & Hanley, Brit. Moll., vol. 1, 1853, p. 163, Pl. 10, fig. 1—3, Pl. H, fig. 1.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 66, Pl. 3, fig. 1, Pl. 50, fig. 2.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 92.

**Findested.** Norskøerne, 10 fv., Advent Bay og Magdalena Bay, 20—40 fv., station 195, 107 fv. (unge exemplarer), station 312, 658 fv. og station 353, 1333 fv. Paa de to sidstnævnte lokaliteter dog blot i døde exemplarer, som antagelig af isen er ført ud paa dybet.

Exemplarerne fra Spitsbergen tilhører dels den typiske form, dels den eiendommelige udbuede og afrundede

**Locality.** The Norwegian Islands (10 fathoms), Advent Bay and Magdalena Bay (20—40 fathoms), Station 195 (107 fathoms; young specimens), Station 312 (658 fathoms), and Station 353 (1333 fathoms). In the last-named two localities, only dead specimens were found, probably carried out into deep water by the ice.

Some of the specimens from Spitsbergen belong to the typical form, some to the peculiar, convex, rounded

form *ovata*, (cfr. A. S. Jensen: Studier over nordiske Mollusker, I, *Mya*<sup>1)</sup>). Ved en fejlskrift er denne form optagen under *mya arenaria* i Frieles fortegnelse over Spitsbergens mollusker.

*Mya truncata* er en circumpolar art, som ved Atlanterhavskysterne har sin sydgrænse ved Cape Cod<sup>2)</sup> og Cadix, hvor Talisman i 1883 fandt et 25 mm. langt skal. Den anføres ogsaa fra Middelhavet, Adriaterhavet og Sortehavet, men er disse angivelser temmelig usikre. I Stillehavet gaar den mod syd til Japan og Vancouver. Den bathymetriske udbredelse er 0—380 fv. Fossil er den kjendt fra Gronland, Spitsbergen, en større del af Europa, Sibirien og Nordamerika.

form *ovata*, (Cf. A. S. Jensen, Studier over nordiske Mollusker, I, *Mya*<sup>1)</sup>). It appears, through a lapsus calami under *Mya arenaria* in Friele's list of the Mollusca of Spitsbergen.

*Mya truncata* is a circumpolar species, that has its southern limit on the shores of the Atlantic, at Cape Cod<sup>2)</sup> and Cadiz. At the latter place, the 'Talisman' found in 1883 a valve that was 25 mm. in length. Its occurrence is also mentioned in the Mediterranean, the Adriatic, and the Black Sea: but these statements are somewhat uncertain. In the Pacific, it extends southwards to Japan and Vancouver I. Its bathymetrical distribution is from 0 to 380 fathoms. It is fossil in Greenland, Spitsbergen, many parts of Europe, Siberia, and North America.

#### ***Xylophaga dorsalis*, Turton.**

*Teredo dorsalis*, Turton, Conch. diction, 1819, p. 185.

*Xylophaga* — Forbes & Hanley, Brit. Moll., vol. 1. 1853, p. 90, Pl. 2, fig. 3, 4.

— — Jeffreys, Brit. Conch., vol. 3. 1865, p. 120, Pl. 4, fig. 3, Pl. 53, fig. 4.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 98.

**Findested.** Station 1, station 8 og Hammerfest, 20 fv. Dybde 20, 650 fv.

*Xylophaga dorsalis*, der forekommer langs hele den norske kyst op til Hammerfest, er udbredt til Middelhavet, Adriaterhavet og Azorerne. Ved de amerikanske kyster forekommer den fra New Foundland til Cap Cod. Den bathymetriske udbredelse er 5—1450 fv. Fossil er den kjendt fra Wienerbækkenet og Kalabrien.

**Locality.** Stations 1 and 8, and Hammerfest (20 fathoms). Depth 20—650 fathoms.

*Xylophaga dorsalis*, which occurs all along the Norwegian coast up to Hammerfest, extends to the Mediterranean, the Adriatic, and the Azores. Its range on the American shores is from Newfoundland to Cape Cod. Its bathymetrical distribution is from 5 to 1450 fathoms. It is a fossil in the Vienna basin and in Calabria.

#### ***Teredo pedicellata*, Quatrefages(?)**

*Teredo pedicellata*, Quatrefages, Ann. Sci. Nat., ser. 3, vol. 11, 1849, p. 26, Pl. 1, fig. 2.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 174, Pl. 54, fig. 3.

— — Clessin, Mart. Chemn. Conch. Cab., Bd. 11, Abth. 4, 1893, p. 68, Pl. 17, fig. 12—14.

En noget slidt, 4 mm. langt skal af en *teredo*, fandtes paa station 124, 640 fv. Da det ved sin størrelse, form og usædvanlig lange stilk minder mest om den af Quatrefages fra den spanske nordkyst beskrevne *teredo pedicellata*, har vi om end med tvil henført det til denne art.

*Teredo pedicellata* har tidligere været kjendt fra Middelhavet og Vesteuropa indtil England.

A somewhat squattered valve of a *Teredo*, 4 mm. in length, was found at Station 124 (640 fathoms). As it most resembles the *Teredo pedicellata* from the north coast of Spain, described by Quatrefages, in its size, shape, and unusually long apophysis, we have referred it, though with some hesitation, to that species.

*Teredo pedicellata* was previously known from the Mediterranean and Western Europe to England.

<sup>1)</sup> Vidensk. Meddelelser, 1900, p. 133.

<sup>2)</sup> Krebs anfører den ifølge Locard ogsaa fra St. Thomas.

<sup>1)</sup> Vidensk. Meddelelser, 1900, p. 133.

<sup>2)</sup> Krebs also mentions it, according to Locard, from St. Thomas.



**Teredo, sp.**

Paa station 353, 1333 fv., erholdtes et træstykke, som var gjennemboret af en *teredo*. Desværre kunde hverken dyr eller skaller trods ivrig søgen paavises, saa arten lader sig ikke bestemme. Rørene har en diameter af  $2\frac{1}{2}$  mm.; skulpturen bestaar af tykke noget uregelmæssige tverstriber.

Vi giver en afbildning af exemplaret.



A piece of wood was found at Station 353 (1333 fathoms), pierced through by a *Teredo*. Unfortunately, notwithstanding careful search, neither animal nor valves could be discovered, so it is impossible to determine the species. The tubes are  $2\frac{1}{2}$  mm. in diameter, and the sculpture consists of broad, somewhat irregular transverse grooves.

We give a figure of the specimen.

Paa station 312, 658 fv., fandtes ligeledes et træstykke, der var gjennemboret af en *teredo*, som heller ikke lod sig bestemme, da ogsaa her manglede baade dyr og skaller. Dennes rør har kun halv saa stor diameter som ovennævnte; skulpturen er glat.

Another piece of wood that had been pierced by a *Teredo* was found at Station 312 (658 fathoms). This is also impossible to determine, as neither animal nor valves were to be found. The diameter of the tubes is only half that of the above, and the sculpture is smooth.

# Scaphopoda.

## Dentalium entale, Linné.

*Dentalium entalis*, Linné, Syst. Nat., ed. 12, 1766, p. 1263.

— — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 449, Pl. 57, fig. 11.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 191, Pl. 55, fig. 1.

*Antalis* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 100.

**Findested.** Husø, Hammerfest og station 173 b, 300 fv. (dødt exemplar).

Denne art, der er almindelig langs hele den norske kyst, er en østatlantisk form, som er udbredt fra Murman-kysten, Finnmarken og Island til Kap det gode haab. Ved Madeira synes den mærkelig nok at mangle, derimod forekommer den baade ved Azorerne og Canariske øer. Endvidere er den tagen i Middelhavet, Adriaterhavet, Egæerhavet samt ved Grønlands sydøstlige kyst. Den bathymetriske udbredelse er 2—437 fv. Fossil er den funden i Norge, nordlige Rusland, England, Belgien, Frankrig, Italien og Grækenland.

**Locality.** Husø, Hammerfest, and Station 173 b (300 fathoms; dead specimen).

This species, which is common all along the Norwegian coast, is an east-Atlantic form which extends from the Murman Coast, Finmark, and Iceland to the Cape of Good Hope. Strange to say, it does not appear in Madeira, though occurring in both the Azores and the Canary Isles. It has also been found in the Mediterranean, the Adriatic, the Ægean Sea, and off the south-east coast of Greenland. Its bathymetrical distribution is from 2 to 437 fathoms. It is found as a fossil in Norway, the north of Russia, England, Belgium, France, Italy, and Greece.

## Dentalium occidentale, Stimpson.

*Dentalium occidentale*, Stimpson, Shells of New England, 1851, p. 28.

— *abyssorum*, M. Sars, Christiania Vidensk. Selsk. Forhandl. 1858, p. 52.

*Antalis striolata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 101, Pl. 20, fig. 10 a b.

*Dentalium occidentale*, Verrill, Proc. U. S. Nat. Museum, vol. 3, 1880, p. 394.

— *entalis* var. *striolatum*, Watson, Rep. Sci. Res. „Challenger“ Exp., Zool., vol. 15, 1886, p. 5.

**Findested.** Stationerne 79, 101, 195, Sognefjord, 100 fv., og Husø, 100 fv. Dybde 100—223 fv.

*Dentalium occidentale* er udbredt fra Spitsbergen og Barentshavet til Azorerne, Cap Verd og Middelhavet og fra Grønland til Maine. Ved den norske kyst er den meget almindelig paa de større dyb. Den bathymetriske udbredelse er 30—1750 fv. Fossil er den kjendt fra Norge, Skotland, England og Sicilien.

**Locality.** Stations 79, 101, and 195, the Sogne Fjord (100 fathoms), and Husø (100 fathoms). Depth 100—223 fathoms.

*Dentalium occidentale* is distributed from Spitsbergen and the Barents Sea to the Azores, Cape Verd, and the Mediterranean, and from Greenland to Maine. It is very common off the Norwegian coast in deep water. Its bathymetrical distribution is from 30 to 1750 fathoms. It is found as a fossil in Norway, Scotland, England and Sicily.

**Dentalium agile, M. Sars.**

*Dentalium agile*, M. Sars, m. s., G. O. Sars, Rem. forms anim. life, part. 1, 1872, p. 31, Pl. 3, fig. 4—15.

*Antalis agilis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 102, Pl. 20, fig. 9 a—b.

*Dentalium entalis*, var. *agile*, Watson, Rep. Sci. Res. Challenger Exp., Zool., vol. 15, 1886, p. 6.

**Findested.** Stationerne 9, 10 og 255. Dybde 206—341 fv.

*Dentalium agile*, der forekommer paa de større dyblangs vor vestkyst fra Stavanger til Lofoten, har en sydligere udbredelse end foregaaende art, idet den gaar til Ascension, Havana og Den mexikanske golf. Artens nordgrænse er Lofoten og New England. Den bathymetriske udbredelse er 60—2547 fv. Fossil er den funden i Italien og paa Rhodes.

**Locality.** Stations 9, 10, and 255. Depth 206—341 fathoms.

*Dentalium agile*, which occurs in the deep fjords along the west coast of Norway, from Stavanger to Lofoten, has a more southern distribution than the preceding species, as it extends to Ascension Isle, Havana, and the Gulf of Mexico. Its northern limit is at Lofoten and New England. Its bathymetrical distribution is from 60 to 2547 fathoms. It is found as a fossil in Italy and Rhodes.

**Siphonodentalium vitreum, M. Sars.**

*Dentalium vitreum*, M. Sars, Nyt Mag. f. Naturvidensk., vol. 6, 1851, p. 178.

*Siphonodentalium* — M. Sars, Christiania Vidensk. Selsk. Forhandl., 1859, p. 182.

— G. O. Sars, Moll. Reg. Arct. Norv., p. 103 & 342, Pl. 7, fig. 2 a—c.

**Findested.** Stationerne 18, 33, 35, 40, 48, 51, 87, 124, 240, 248, 251, 253, 257, 260, 261, 262, 267, 273, 283, 295, 312, 323, 326, 338, 357 og 363. Dybde 123—1215 fv.

*Siphonodentalium vitreum* er kjendt fra Grønland, Nordamerikas østkyst indtil New England, Portugal, Irlands vestkyst, Færøkanalen, Island, Spitsbergen, Barentshavet, Novaja Semlja og Karahavet. Ved den norske kyst er den ikke funden søndenfor polarcirkelen. Den bathymetriske udbredelse er 20—1750 fv. Fossil er den funden i Norge, Kanada og Grinnellland.

**Locality.** Stations 18, 33, 35, 40, 48, 51, 87, 124, 240, 248, 251, 253, 257, 260, 261, 262, 267, 273, 283, 295, 312, 323, 326, 338, 357, and 363. Depth 123—1215 fathoms.

*Siphonodentalium vitreum* is reported from Greenland, the east coast of North America down to New England, Portugal, the west coast of Ireland, the Faroe Channel, Iceland, Spitsbergen, the Barents Sea, Novaja Semlja, and the Kara Sea. On the Norwegian coast, it is not found south of the arctic Circle. Its bathymetrical distribution is from 20 to 1750 fathoms. It is found as a fossil in Norway, Canada and Grinnell Land.

**Siphonodentalium quinquangulare, Forbes.**

*Dentalium quinquangulare*, Forbes, Rep. Brit. Assoc., 1843, p. 135.

*Siphonodentalium pentagonum*, M. Sars, Christiania Vidensk. Selsk. Forhandl., 1864, p. 307, Pl. 7, fig. 45—51.

*Siphonentalis tetragona*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 105, Pl. 20, fig. 13 a—c.

*Siphodentalium quinquangulare*, Jeffreys, Proc. Zool. Soc., 1882, p. 266.

**Findested.** Stationerne 1, 9, 10 og 255. Dybde 206—650 fv.

Denne art forekommer i den østlige del af Atlanterhavet fra Norge og Hebriderne til Cap Verd; endvidere er den funden i Middelhavet og Egæerhavet samt Jamaika og Barbados. Ved den norske kyst er den udbredt fra Christianiafjorden til Vestfinmarken. Den bathymetriske udbredelse er 40—2090 fv. Fossil er den kun funden paa Sicilien.

**Locality.** Stations 1, 9, 10, and 255. Depth 206—650 fathoms.

This species occurs in the eastern part of the Atlantic, from Norway and the Hebrides to Cape Verd. It is also found in the Mediterranean and the Ægean Sea, and off Jamaica and Barbadoes. On the Norwegian coast it extends from the Christiania Fjord to west Finmark. Its bathymetrical distribution is from 40 to 2090 fathoms. It is found as a fossil only in Sicily.



**Siphonodentalium lofotense, M. Sars.**

*Siphonodentalium lofotense*, M. Sars, Christiania Vidensk. Selsk. Forhandl., 1864, p. 297, Pl. 6, fig. 29—33.

— — — Jeffreys, Brit. Conch., vol. 5, 1869, p. 195, Pl. 161, fig. 2.

*Siphonentalis lofotensis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 104, Pl. 20, fig. 11 a—b.

**Findested.** Station 79, 155 fv. og station 253, 263 fv.

**Locality.** Stations 79 (155 fathoms) and 253 (263 fathoms).

*Siphonodentalium lofotense* er udbredt fra Vestfinmarken og Grønland til Middelhavet og kysten af New England. Ved den norske kyst er den ret almindelig paa de større dyb. Den bathymetriske udbredelse er 70—1750 fv.

*Siphonodentalium lofotense* is distributed from West Finmark and Greenland to the Mediterranean and the coast of New England. It is quite common off the Norwegian coast in deep water. Its bathymetrical distribution is from 30 to 1750 fathoms.

**Cadulus subfusiformis, M. Sars.**

*Siphonodentalium subfusiforme*, M. Sars, Christiania Vidensk. Selsk. Forhandl., 1864, p. 301, Pl. 6, fig. 36—40, Pl. 7, fig. 41—44.

*Cadulus subfusiformis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 106, Pl. 20, fig. 14 a—b.

— — — Jeffreys, Proc. Zool. Soc., 1882, p. 664.

**Findested.** Stationerne 1, 10, 195, 255 og 290. Dybde 107—650 fv.

**Locality.** Stations 1, 10, 195, 255, and 290. Depth 107—650 fathoms.

Denne art er hidtil blot kjendt fra Norge, Shetlandsøerne, Biskayerbugten og Middelhavet. Ved vore kyster er den udbredt fra Kristianiafjorden til Vestfinmarken. Den bathymetriske udbredelse er 40—650 fv. Fossil er den kun med sikkerhed paavist ved Kristiania.

This species has hitherto been known only in Norway, the Shetland Isles, the Bay of Biscay, and the Mediterranean. It extends, on the Norwegian coast, from the Christiania Fjord to West Finmark. Its bathymetrical distribution is from 40 to 650 fathoms. As a fossil, it is only found with certainty at Christiania.

**Cadulus propinquus, G. O. Sars.**

*Cadulus propinquus*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 106, Pl. 20, fig. 15 a—b.

— — — Jeffreys, Proc. Zool. Soc., 1882, p. 664.

— — — Locard, Exp. Sci, Travailleur & Talisman, Moll. Test., vol. 2, 1898, p. 139.

**Findested.** Stationerne 1, 79 og 101. Dybde 155—650 fv.

**Locality.** Stations 1, 79, and 101. Depth 155—650 fathoms.

*Cadulus propinquus* forekommer langs Norges vestkyst op til Finmarken. Den er endvidere kjendt fra Biskayerbugten, Portugal, Nordafrikas vestkyst og Middelhavet. Den bathymetriske udbredelse er 40—1220 fv.

*Cadulus propinquus* occurs along the west coast of Norway up to Finmark. It is moreover known in the Bay of Biscay, Portugal, off the north-west coast of Africa, and in the Mediterranean. Its bathymetrical distribution is from 40 to 1220 fathoms.

# Placophora.

## *Hanleyia hanleyii*, Bean.

*Chiton hanleyi*, Bean, Thorpe Brit. Mar. Conch., Suppl. 1844, p. 263, fig. 57.

— — Lovén, Ind. Moll. Scand., 1846, p. 27.

*Hanleyia debilis*, Gray, Guide, 1857, p. 186.

*Chiton hanleyi*, Jeffreys, Brit. Conch., vol. 3, 1865, p. 215, vol. 5, p. 198, Pl. 55, fig. 5.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 109, Pl. 7, fig. 5 a—i.

*Hanleyia debilis*, Dall, Proc. U. S. Nat. Museum vol. 1, 1878, p. 319.

*Hanleya hanleyi*, Tryon, Man. of Conch., vol. 14, 1892, p. 17, Pl. 3, fig. 71—79.

Et par exemplarer af denne art toges ved Alten, 30 fv.

*Hanleyia hanleyi* forekommer sparsomt langs den skandinaviske kyst fra Varangerfjorden til Bohuslän. Endvidere er den kjendt fra Kattegat, Færøerne, Britiske øer, Middelhavet, Nordamerikas østkyst og Beringshavet. Den synes saaledes at være circumpolar. Jeffreys anfører den desuden fra Den karaimiske sjø. Den bathymetriske udbredelse er 10—300 fv.

A few specimens were found at Alten (30 fathoms).

*Hanleyia hanleyi* occurs sparingly along the Scandinavian coast, from the Varanger Fjord to Bohuslän. It has also been found in the Kattegat, off the Faroe Isles, the British Isles, in the Mediterranean, off the east coast of North America, and in the Bering Sea. It thus appears to be circumpolar. Jeffreys also mentions it from the Carribean Sea. Its bathymetrical distribution is from 10 to 300 fathoms.

## *Leptochiton alveolus*, M. Sars.

*Chiton alveolus*, M. Sars, m. s., Lovén, Ind. Moll. Scand., 1846, p. 27.

*Lepidopleurus* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 110, Pl. 7, fig. 3 a—i, Pl. I, fig. 7.

*Leptochiton* — Dall, Proc. U. S. Nat. Museum, vol. 1, 1878, p. 317.

— — Haddon, Rep. Sci. Res. „Challenger“ Exp., Zool., vol. 15, 1886, p. 12.

*Lepidopleurus* — Tryon, Man. of Conch., vol. 14, 1892, p. 6, Pl. 2, fig. 23—31.

**Findested.** Stationerne 147, 255, 260 og Sognefjord. Dybde 127—341 fv.

Denne art er udbredt langs Norges vest- og nordkyst fra Hardangerfjorden til Vestfinmarken. Den er endvidere funden ved Bohuslän, udenfor Kanalen, Biskayerbugten, vestkysten af Spanien, Portugal og Nordamerikas østkyst. Den bathymetriske udbredelse er 100—1073 fv.

**Locality.** Stations 147, 255, and 260, and the Sogne Fjord. Depth 127—341 fathoms.

This species is distributed along the west and north coasts of Norway, from the Hardanger Fjord to West Finmark. It is also found at Bohuslän, at the mouth of the English Channel, in the Bay of Biscay, off the west coast of Spain and Portugal, and the east coast of North America. Its bathymetrical distribution is from 100 to 1073 fathoms.

**Leptochiton cancellatus**, Sowerby.

<i>Chiton</i>	<i>cancellatus</i> , Sowerby. Conch. Ill., 1839, fig. 104, 105.
—	— Jeffreys, Brit. Conch., vol. 3, 1865, p. 217, vol. 5, p. 198, Pl. 56, fig. 1.
<i>Lepidopleurus</i>	— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 111, Pl. 7, fig. 6 a—h, Pl. 1, fig. 8.
<i>Leptochiton</i>	— Dall, Proc. U. S. Nat. Museum, vol. 1, 1878, p. 315.
<i>Lepidopleurus</i>	— Tryon, Man. of Conch., vol. 14, 1892, p. 3, Pl. 3, fig. 54—58.

**Findested.** Bodø, Tromsø, 30 fv., stationerne 26, 147 og 270. Dybde 30—237 fv.

*Leptochiton cancellatus* forekommer ved De britiske øer, Spanien, Middelhavet, Adriaterhavet, Alaska og Norge, hvor den har sin nordgrænse ved Vestfinmarken. Dall anfører den ogsaa fra Grønland; den findes imidlertid ikke optagen i Posselts fortegnelse over Grønlands mollusker. Muligens er det dog denne art, Posselt omtaler under navnet *chiton arcticus*. Den bathymetriske udbredelse er 6—237 fv.

**Locality.** Bodø, Tromsø (30 fathoms), Stations 26, 147, and 270. Depth 30—237 fathoms

*Leptochiton cancellatus* occurs off the British Isles, Spain, in the Mediterranean, the Adriatic, off Alaska, and Norway, in the last-named country having its northern limit in West Finmark. Dall also mentions it from Greenland, but it is not included in Posselt's list of the Mollusca of Greenland. It is possible, however, that it is this species that Posselt mentions under the name of *Chiton arcticus*. Its bathymetrical distribution is from 6 to 237 fathoms.

**Leptochiton arcticus**, G. O. Sars.

<i>Lepidopleurus arcticus</i> , G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 112, Pl. 7, fig. 7 a—h.	•
— — Schneider, Tromsø Museums årshæfter, vol. 8, 1886, p. 97.	
— — Tryon, Man. of Conch., vol. 14, 1892, p. 5, Pl. 3, fig. 59—63.	

Denne art foreligger kun fra Alten, 30 fv. I Frieles foreløbige beretning om Spitsbergens molluskfauna findes den opført fra Advent Bay, 20 fv., men har det ved senere undersøgelse vist sig, at exemplarerne fra denne localitet ikke tilhører *leptochiton arcticus* men *trachydermon albus*. *Leptochiton arcticus* maa derfor igjen udgaa af Spitsbergens fauna.

*Leptochiton arcticus* er kjendt fra Tromsø, Finmarken, Murmankysten og Grønland. Endvidere er den ifølge Jeffreys funden af Lightning expeditionen i Færokanalen. Den bathymetriske udbredelse er 20—229 fv.

Det er under stor tvivl, vi optager denne art. Exemplarerne fra Alten har alle Sars's karakterer, men dog har vi vanskelighed for at adskille dem fra *Leptochiton cancellatus*. Af denne grund skulde vi i overensstemmelse med Dall (op cit., pag. 316) være mest tilbøielig til at betragte den som en varietet af denne art. Ogsaa Sparre Schneider synes at have vanskelighed for at holde disse to former ud fra hinanden.

This species was only found at Alten (30 fathoms). In Friele's preliminary report on the mollusc fauna of Spitsbergen, it is mentioned from Advent Bay (20 fathoms); but subsequent examination has proved that the specimens from this locality do not belong to *Leptochiton arcticus*, but to *Trachydermon albus*. *Leptochiton arcticus* must therefore once more be omitted from the fauna of Spitsbergen.

*Leptochiton arcticus* is reported from Tromsø, Finmark, the Murman Coast, and Greenland. According to Jeffreys, it was also found by the 'Lightning' Expedition in the Faroe Channel. Its bathymetrical distribution is from 20 to 229 fathoms.

It is with great doubt that we admit this species. All the specimens from Alten have Sars's characters, but yet we have a difficulty in distinguishing them from *Leptochiton cancellatus*. For this reason we are most inclined, with Dall (l. c., p. 316), to regard it as a variety of that species. Sparre Schneider also appears to have difficulty in keeping these two forms separate.



**Leptochiton asellus**, Spengler.

*Chiton asellus*, Spengler, *Skriv. Nat. Selsk.*, vol. 4, 1797, p. 99.

— Forbes & Hanley, *Brit. Moll.*, vol. 2, 1853, p. 407, Pl. 59, fig. 1, 2, Pl. AA, fig. 5.

— *cinereus*, Jeffreys, *Brit. Conch.*, vol. 3, 1865, p. 218, vol. 5, p. 198, Pl. 56, fig. 2.

*Lepidopleurus cinereus*, G. O. Sars, *Moll. Reg. Arct. Norv.*, 1878, p. 112, Pl. 7, fig. 8 a—h.

*Leptochiton asellus*, Dall, *Proc. U. S. Nat. Museum*, vol. 1, 1878, p. 318.

*Lepidopleurus* — Tryon, *Man. of Conch.*, vol. 14, 1892, p. 3, Pl. 3, fig. 64—66.

*Chiton cinereus*, Linné, har af flere forfattere, saasom Jeffreys og G. O. Sars, været henført til *chiton asellus*, Spengler, medens andre, saasom Forbes & Hanley, Dall og Tryon, som det synes os, med større ret har anseet den for identisk med *chiton marginatus*, Pennant. For at undgaa confusion har vi ikke villet benytte Linné's artsnavn, men istedet foretrukket at bruge Spenglers og Pennants for disse to arter.

*Leptochiton asellus* fandtes ved Husø og Bodo. Den er en af vore mest almindelige arter. Mod nord gaar den til Kvæningen (70° n. br.), hvor Sparre Schneider bar taget et lidet exemplar. Arten er udbredt langs Vest-europas kyster fra Island til Spanien. I Kattegat gaar den ned til Belterne. Den bathymetriske udbredelse er 0—150 fv. Fossil er den kjendt fra Norge, Skotland og Sicilien.

*Chiton cinereus*, Linnæus, has been referred by several writers — e. g. Jeffreys and G. O. Sars — to *Chiton asellus*, Spengler, while others — e. g. Forbes & Hanley, Dall, and Tryon — have, as seems to us with more justification, considered it to be identical with *Chiton marginatus*, Pennant. In order to avoid confusion, we have refrained from using Linnæus' specific name, and have preferred in stead to employ Spengler's and Pennant's for these two species.

*Leptochiton asellus* was found at Husø and Bodø. It is one of the most common Norwegian species. It extends north-wards as far as Kvæningen (70° N. Lat.), where Sparre Schneider found one small specimen. The species is distributed along the shores of Western Europe, from Iceland to Spain. In the Kattegat it extends south-wards as far as the Belts. Its bathymetrical distribution is from 0 to 150 fathoms. It occurs as a fossil in Norway, Scotland, and Sicily.

**Trachydermon exaratus**, G. O. Sars.

*Lophyrus exaratus*, G. O. Sars, *Moll. Reg. Arct. Norv.*, 1878, p. 113, Pl. 8, fig. 1 a—k, Pl. II, fig. 1.

*Trachydermon* — Verrill, *Trans. Connecticut Acad.*, vol. 6, 1884, p. 208, Pl. 30, fig. 2.

*Ischnochiton* — Tryon, *Man. of Conch.*, vol. 14, 1892, p. 71, Pl. 7, fig. 39—49.

Denne art foreligger kun fra station 255 (Vestfjorden), 341 fv. Den er tidligere kun funden sparsomt langs Norges vestkyst fra Bergen til Lofoten samt ved Nordamerikas østkyst (Marthas Vineyard og Florida). Den bathymetriske udbredelse er 100—341 fv.

This species was only found at Station 255 (West Fjord, 341 fathoms). Previously it had only been found in small numbers along the west coast of Norway, from Bergen to Lofoten, and off the east coast of North America (Martha's Vineyard and Florida). Its bathymetrical distribution is from 100 to 341 fathoms.

**Trachydermon albus**, Linné.

*Chiton albus*, Linné, *Syst. Nat.*, ed. 12, 1766, p. 1107.

— Jeffreys, *Brit. Conch.*, vol. 3, 1865, p. 220, vol. 5, p. 199, Pl. 56, fig. 3.

*Lophyrus* — G. O. Sars, *Moll. Reg. Arct. Norv.*, 1878, p. 114, Pl. 8, fig. 2 a—h, Pl. I, fig. 9.

*Trachydermon* — Dall, *Proc. U. S. Nat. Museum*, vol. 1, 1878, p. 322.

*Ischnochiton* — Tryon, *Man. of Conch.*, vol. 14, 1892, p. 70, Pl. 7, fig. 35—38.

**Findested.** Saltstrømmen, Tromsø 30—40 fv., Alten 30 fv., Hammerfest 20 fv., Jan Mayen 20—30, Advent Bay 20 fv., station 195, 107 fv. og station 270, 136 fv.

**Locality.** Saltstrømmen, Tromsø (30—40 fathoms), Alten (30 fathoms), Hammerfest (20 fathoms), Jan Mayen (20—30 fathoms), Advent Bay (20 fathoms), and Stations 195 (107 fathoms) and 270 (136 fathoms).

*Trachydermon albus* er en circumpolar art, som er kjendt fra Grønland, det nordlige Amerika fra Sitka til Cape Cod, Nordenuropa, hvor den har sin sydgrænse ved England og de danske Belter; Spitsbergen, Jan Mayen, Franz Josefsland, Barentshavet, Novaja Semlja, Pitlekai og Beringshavet. Den er ret almindelig langs hele den norske kyst. Den bathymetriske udbredelse er 5—337 fv. Fossil er den funden ved Fort William.

*Trachydermon albus* is a circumpolar species, known in Greenland, the north of North America from Sitka to Cape Cod, Northern Europe, where it has its southern limit at England and the Danish Belts, Spitsbergen, Jan Mayen, Franz Josef Land, the Barents Sea, Novaja Semlja, Pitlekai, and the Bering Sea. It is quite common all along the Norwegian coast. Its bathymetrical distribution is from 5 to 337 fathoms. It is found a fossil at Fort William.

#### **Trachydermon marginatus, Pennant.**

*Chiton marginatus*, Pennant, Brit. Zool., vol. 4, 1777, p. 71, Pl. 36, fig. 2.

— *cinereus*, Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 402, Pl. 58, fig. 1.

— *marginatus*, Jeffreys, Brit. Conch., vol. 3, 1865, p. 221, Pl. 56, fig. 5.

*Craspedochilus* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 115, Pl. 20, fig. 16 a—h. Pl. II, fig. 2.

*Trachydermon cinereus*, Dall, Proc. U. S. Nat. Museum, vol. 1, 1878, p. 323.

*Ischnochiton* — Tryon, Man. of Conch., vol. 14, 1892, p. 68, Pl. 6, fig. 25—31.

*Trachydermon marginatus* fandtes i et par eksemplarer ved Husø. Den er udbredt langs hele Vesteuropa fra Tromsø, Island og Færøerne til Kielerbugten, Middelhavet og Adriaterhavet. Endvidere er den kjendt fra Grønland. Den anføres ligeledes fra Nordamerikas øst- og vestkyst, men synes dens forekomst her efter de senere undersøgelser at være meget tvilsom. Den bathymetriske udbredelse er 0—40 fv. Fossil er den funden i Norge, England og Sicilien.

Two or three specimens of *Trachydermon marginatus* were found at Husø. It is distributed over the whole of Western Europe, from Tromsø, Iceland, and the Faroe Isles, to Kiel Bay, the Mediterranean, and the Adriatic. It is further known to occur off Greenland. It has also been reported from the east and west coasts of North America; but its occurrence there, according to subsequent investigations, seems to be very doubtful. Its bathymetrical distribution is from 0 to 40 fathoms. It is found as a fossil in Norway, England, and Sicily.

#### **Trachydermon ruber, Lowe.**

*Chiton ruber*, Lowe, Zool. Journ., vol. 2, 1825, p. 101, Pl. 5, fig. 2.

— Jeffreys, Brit. Conch., vol. 3, 1865, p. 244, vol. 5, p. 199, Pl. 56, fig. 4.

*Boreochiton* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 116, Pl. 8, fig. 4 a—l, Pl. II, fig. 3.

*Trachydermon* — Dall, Proc. U. S. Nat. Museum, vol. 1, 1878, p. 321.

*Ischnochiton* — Tryon, Man. of Conch., vol. 14, 1892, p. 80, Pl. 7, fig. 50—56.

Denne art fandtes ved Tromsø, 10—20 fv. og Jan Mayen, 30 fv. Den er circumpolar og kjendt fra Grønland, det nordlige af Amerika indtil Sitka og Maine, Nordenuropa indtil Øresund og De britiske øer, Spitsbergen, Novaja Semlja, Beringshavet, Kamschatka og det nordlige af Japan. Den bathymetriske udbredelse er 0—80 fv. Fossil er den funden i Norge, England og det nordlige Rusland.

This species was found at Tromsø (10—20 fathoms) and Jan Mayen (30 fathoms). It is circumpolar, and is known in Greenland, the north of North America down to Sitka and Maine, Northern Europe down to Øresund and the British Isles, in Spitsbergen, Novaja Semlja, the Bering Sea, Kamtchatka, and the north of Japan. Its bathymetrical distribution is from 0 to 80 fathoms. It is fossil in Norway, England, and the north of Russia.

**Tonicella marmorea**, Fabricius.

*Chiton marmoreus*. Fabricius, Fau. Grönl., 1780, p. 420.

— Jeffreys, Brit. Conch., vol. 3, 1865, p. 227, vol. 5, p. 199, Pl. 56, fig. 7.

*Boreochiton* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 116, Pl. 8, fig. 3 a—l, Pl. II, fig. 4.

*Tonicella marmorea*, Dall, Proc. U. S. Nat. Museum, vol. 1, 1878, p. 324.

— Tryon, Man. of Conch., vol. 14, 1892, p. 41, Pl. 10, fig. 8—15.

*Tonicella marmorea* fandtes ved Hammerfest og Jan Mayen, 30 fv.

Som foregaaende er den circumpolar; den er kjendt fra Nordeuropa, hvor den har sin sydgrænse ved de danske øer, Holland og De britiske øer; Spitsbergen, Franz Josefs-land, Novaja Semlja, Okotske hav, Japan, Grønland og det nordlige af Amerika indtil Sitka og New England. Jeffreys anfører den desuden fra Mexico. Den er meget almindelig langs hele den norske kyst. Den bathymetriske udbredelse er 0—100 fv. Fossil er den kjendt fra Norge, England, nordlige Rusland og Spitsbergen.

*Tonicella marmorea* was found at Hammerfest and Jan Mayen (30 fathoms).

Like the preceding species, it is circumpolar. Its distribution is the north of Europe — where it has its southern limit at the Danish islands, Holland and the British Isles — Spitsbergen, Franz Josef Land, Novaja Semlja, the Sea of Okhotsk, Japan, Greenland, and the north of North America, down to Sitka and New England. Jeffreys also reports it from Mexico. It is very common all along the Norwegian coast. Its bathymetrical distribution is from 0 to 100 fathoms. It is found as a fossil in Norway, England, the north of Russia, and Spitsbergen.



## Gastropoda.

### *Patina pellucida*, Linné.

*Patella pellucida*, Linné, Syst. Nat., ed. 12, 1766, p. 1260.

*Helcion pellucidum*, Jeffreys, Brit. Conch., vol. 3, 1865, p. 242, vol. 5, p. 199, Pl. 58, figs. 1, 2.

*Nacella pellucida*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 119, Pl. II, fig. 8.

*Patina* — Dall, Proc. U. S. Nat. Museum, vol. 1, 1878, p. 343.

*Patina pellucida* foreligger kun fra Husø. Den er en østatlantisk art, som er udbredt fra Vestfinmarken og Island til Marocos vestkyst (Cap Magador). Den bathymetriske udbredelse er 0—40 fv. Fossil er den funden i Norge, Skotland, Irland og Sicilien.

*Patina pellucida* was only found at Husø. It is an east Atlantic species, which extends from West Finmark and Iceland to the west coast of Morocco (Cape Mogador). Its bathymetrical distribution is from 0 to 40 fathoms. It is a fossil in Norway, Scotland, Ireland and Sicily.

### *Acmaea rubella*, Fabricius.

*Patella rubella*, Fabricius, Fau. GrønL., 1780, p. 386.

*Tectura* — Jeffreys, Ann. Mag. Nat. Hist., ser. 4, vol. 19, 1877, p. 231.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 121, Pl. 8, fig. 5 a—b, Pl. II, fig. 11.

*Acmaea* — Dall, Proc. U. S. Nat. Museum, vol. 1, 1878, p. 337.

*Acmaea rubella* fandtes blot i et dødt exemplar paa station 173 b, 300 fv. Den er en hoiarktisk art, som ved vore kyster ikke er funden søndenfor Tromsø. Forøvrigt er den kjendt fra Murmankysten, Novaja Semlja, Spitsbergen, Jan Mayen, Grønland, New Foundland, Davisstrædet, Barrowstrædet og Alaska. Den bathymetriske udbredelse er 3—300 fv. Fossil er den kjendt fra Port Kennedy og det nordlige Rusland.

The only specimen of *Acmaea rubella* was a dead one found at station 173 b (300 fathoms). It is a high arctic species, that is not found on the Norwegian coast south of Tromsø. It also occurs off the Murman Coast, Novaja Semlja, Spitsbergen, Jan Mayen, Greenland, Newfoundland, in Davis Strait, Barrow Strait, and off Alaska. Its bathymetrical distribution is from 3 to 300 fathoms. It is a fossil at Port Kennedy, and in the north of Russia.

***Pilidium fulvum*, O. F. Müller.**

*Patella fulva*, O. F. Müller, Prodr. Zool. Dan., 1776, p. 227.

*Pilidium fulvum*, Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 441, Pl. 62, figs. 6, 7, Pl. A A, fig. 3.

*Tectura fulva*, Jeffreys, Brit. Conch., vol. 3, 1865, p. 250, Pl. 58, fig. 5.

*Scutellina* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 122, Pl. II, fig. 12.

*Pilidium fulvum*, Dall, Proc. U. S. Nat. Museum, vol. 1, 1878, p. 335.

**Findested.** Stationerne 79, 173 b, 192, 195, 257 og Huso, 40 fv. Dybde 40—649 fv.

*Pilidium fulvum* er en nordatlantisk art, som er udbredt fra Finmarken til Biskayerbugten. Ifølge Jeffreys skal den ogsaa forekomme ved Tripolis. Dall anfører den desuden fra Nordamerikas østkyst. Den bathymetriske udbredelse er 10—649 fv. Fossil er den funden i Norge og paa Sicilien.

**Locality.** Stations 79, 173 b, 192, 195, and 257, and Huso (40 fathoms). Depth 40—649 fathoms.

*Pilidium fulvum* is a North Atlantic species, extending from Finmark to the Bay of Biscay. According to Jeffreys, it also occurs in Tripoli; and Dall reports it from the east coast of North America. Its bathymetrical distribution is from 10 to 649 fathoms. It is a fossil in Norway and Sicily.

***Lepeta cæca*, O. F. Müller.**

*Patella cæca*, O. F. Müller, Prodr. Zool. Dan., 1776, p. 237.

*Lepeta* — Jeffreys, Brit. Conch., vol. 3, 1865, p. 252, Pl. 58, fig. 6.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 123, Pl. 20, fig. 17 a—b, Pl. II., fig. 13.

**Findested.** Stationerne 237, 260, 267, 270, 326, 357, Alten, 30 fv. og Magdalena Bay, 20 fv. Dybde 20—263 fv.

*Lepeta cæca* er en circumpolar art, som er kjendt fra Grønland, det nordlige Amerika indtil Alaska og Cape Cod, Vestindien, Nordeuropa indtil Skotlands vestkyst, Kattegat og Øresund, Jan Mayen, Spitsbergen, Barentshavet, Franz Josefsland, Novaja Semlja, Ishavet nord for Beringsstrædet, Okotske hav og Japan. Den bathymetriske udbredelse er 4—690 fv. Fossil forekommer den over en større del af den palæarktiske region.

**Locality.** Stations 237, 260, 267, 270, 326, and 357, Alten (30 fathoms), and Magdalena Bay (20 fathoms). Depth 20—263 fathoms.

*Lepeta cæca* is a circumpolar species, known from Greenland, the north of North America down to Alaska and Cape Cod, the West Indies, the north of Europe as far as the west coast of Scotland, the Kattegat, and Øresund, from Jan Mayen, Spitsbergen, the Barents Sea, Franz Josef Land, Novaja Semlja, the Arctic Ocean north of the Bering Straits, the Sea of Okhotsk, and Japan. Its bathymetrical distribution is from 4 to 690 fathoms. It occurs as a fossil in many parts of the palæarctic region.

***Puncturella noachina*, Linné.**

*Patella noachina*, Linné, Mantissa plant., 1771, p. 551.

*Puncturella* — Forbes & Hanley, Brit. Moll., vol. 2, 1853, p. 474, Pl. 62, figs. 10—12, Pl. B B, figs. 4—6.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 257, Pl. 6, fig. 3, vol. 5, p. 200, Pl. 59, fig. 1.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 124, Pl. III, fig. 3.

**Findested.** Stationerne 173 b, 192, 195, 237, 260, 270, 338 og 357. Dybde 107—649 fv.

*Puncturella noachina* synes at have en kosmopolitisk udbredelse. Den er kjendt fra Grønland, Amerikas nord- og østkyst indtil Cape Cod. Nord- og Vesteuropas kyster indtil Spanien, Jan Mayen, Spitsbergen, Franz Josefsland, Novaja Semlja, Beringshavet, Okotske hav, Korea og Japan. Challengerexpeditionen har desuden fundet den ved Magellanstrædet, Marion Island, Prince Edward Island og Kerguelen i Sydhavet. Den bathymetriske udbredelse er 5—1095 fv. Fossil er den funden i Skandinavien, Britiske

**Locality.** Stations 173 b, 192, 195, 237, 260, 270, 338, and 357. Depth 107—649 fathoms.

*Puncturella noachina* seems to have a cosmopolitan distribution. It is known from Greenland, the north coast of N. America and the east coast down to Cape Cod, the coasts of Northern and Western Europe as far as Spain, Jan Mayen, Spitsbergen, Franz Josef Land, Novaja Semlja, the Bering Sea, the Sea of Okhotsk, Corea and Japan. The 'Challenger' Expedition also found it in the Straits of Magellan, on Marion Island, Prince Edward Island, and Kerguelen Land in the Southern

øer, Italien, Labrador, Grønland, Novaja Semlja, nordlige Rusland og Spitzbergen.

Ocean. Its bathymetrical distribution is from 5 to 1095 fathoms. It is a fossil in Scandinavia, the British Isles, Italy, Labrador, Greenland, Novaja Semlja, northern Russia and Spitsbergen.

#### **Emarginula crassa, Sowerby.**

*Emarginula crassa*, Sowerby, Min. Conch., 1840, p. 73, Pl. 33.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 263, vol. 5, p. 200, Pl. 59, fig. 4.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 125, Pl. III, fig. 2.

**Findested.** Station 255 (Vestfjorden), 624 fv.

Denne ved vor syd- og vestkyst ikke sjeldne art har sin nordgrænse ved Lofoten. Mod syd gaar den til Biskayerbugten. Den bathymetriske udbredelse er 10—624 fv. Fossil er den funden i Norge, England, Belgien og Italien.

**Locality.** Station 255 (West Fjord, 624 fathoms).

This species, which is not uncommon on the south and west coasts of Norway, has its northern limit off Lofoten. Southwards it extends to the Bay of Biscay. Its bathymetrical distribution is from 10 to 624 fathoms. It is a fossil in Norway, England, Belgium, and Italy.

#### **Scissurella crispata, Fleming.**

*Scissurella crispata*, Fleming, Mem. Wern. Soc., vol 6, 1832, p. 385, Pl. 6, fig. 3.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 283, Pl. 7, fig. 2, vol. 5, p. 201, Pl. 60, fig. 3.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 126, Pl. 8, fig. 7 a—b, Pl. III, fig. 4, Pl. XVIII, fig. 1.

**Findested.** Stationerne 40, 164, 267 og Husø, 40—60 fv. Dybde 40—1215 fv.

*Scissurella crispata* er udbredt fra Grønland til Vestindien og fra Spitsbergen og Murmankysten til Middelhavet og Azorerne. Challengerexpeditionen har desuden faaet den mellem Marion Island og Prince Edward Island. Ved den norske kyst er den ret almindelig. Den bathymetriske udbredelse er 7—1215 fv. Fossil er den funden over en større del af Europa.

**Locality.** Stations 40, 164, and 267, and Husø (40—60 fathoms). Depth 40—1215 fathoms.

*Scissurella crispata* is distributed from Greenland to the West Indies, and from Spitsbergen and the Murman Coast to the Mediterranean and the Azores. The 'Challenger' Expedition found it moreover between Marion Island and Prince Edward Island. It is quite common on the Norwegian coast. Its bathymetrical distribution is from 7 to 1215 fathoms. It is a fossil in many parts of Europe.

#### **Mølleria costulata, Møller.**

*Margarita (?) costulata*, Møller, Ind. Moll. Grøn., 1842, p. 8.

*Mølleria* — Jeffreys, Ann. Mag. Nat. Hist., ser. 4, vol. 19, 1877, p. 235.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 127 og 243, Pl. 9, fig. 8 a—c, Pl. 33, fig. 4, Pl. III, fig. 5, Pl. XVIII, fig. 2.

**Findested.** Station 173 b, 300 fv., station 267, 148 fv. og Tromsø, 5—10 fv.

*Mølleria costulata* er en nordatlantisk art, der er udbredt fra Grønland til Vestindien og fra Spitsbergen. Hvidehavet og Murmankysten til Marocos vestkyst. Ved den norske kyst er den endnu ikke paavist søndenfor Bodø.

**Locality.** Stations 173 b (300 fathoms) and 267 (148 fathoms), and Tromsø (5—10 fathoms).

*Mølleria costulata* is a North Atlantic species, ranging from Greenland to the West Indies, and from Spitsbergen, the White Sea, and the Murman Coast, to the west coast of Morocco. In Norway its existence has not



Den bathymetriske udbredelse er 5—1095 fv. Fossil er den funden i Skandinavien, nordlige Rusland, Spitsbergen, Shetlandsøerne, Skotland og Canada.

yet been proved south of Bodø. The bathymetrical distribution is from 5 to 1095 fathoms. It is a fossil in Scandinavia, the north of Russia, Spitsbergen, the Shetland Isles, Scotland, and Canada.

### **Cyclostrema basistriatum**, Brugnone,

*Cyclostrema basistriatum*, Brugnone, Miscel. Malac., vol. 2, 1876, p. 17, fig. 24.

G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 128, Pl. 8, fig. 8 a—c, Pl. III, fig. 6, Pl. XVIII, fig. 3.

— — — Jeffreys, Proc. Zool. Soc., 1883, p. 90.

**Findested.** Stationerne 154, 173 b, 255 og Husø, 40—60 fv. Dybde 40—350 fv.

*Cyclostrema basistriatum* er udbredt langs hele den norske kyst fra Christianiafjorden til Lofoten og Vesterdaalen. Endvidere er den kjendt fra det nordlige af Atlanterhavet, hvor den er funden af Valorous, Lightning, Porcupine og Travailleux expeditionerne. Sydgrænsen for artens udbredelse er ved Portugal. Den forekommer desuden ved Nordamerikas østkyst. Ifølge Jeffreys skal den ogsaa forekomme ved Spitsbergen. Den bathymetriske udbredelse er 40—1333 fv. Fossil er den funden i Ficaragzi.

Vi har havt anledning til at sammenligne et original-exemplar af *Cyclostrema affine*, Verrill<sup>1)</sup>, med den ved vor kyst forekommende *cyclostrema basistriatum*. Saavel i skulptur som i form fandtes der saa stor overensstemmelse mellem dem, at vi maa anse dem for identiske. At domme efter det her omtalte exemplar synes Verrills tegning at være altfor slank. Mellem *cyclostrema affine* og *cyclostrema diaphanum*, Verrill, er der liden forskjel. Den sidste har dog en finere skulptur rundt umbilicus; den ligner i denne henseende mere *cyclostrema rugulosum*. Da vi imidlertid ikke har noget exemplar af Verrills form, tør vi ikke nærmere udtale os herom.

Vi er uenig med W. H. Dall, der anser *cyclostrema affine* identisk med *cyclostrema trochoide*, Jeff.<sup>2)</sup>.

**Locality.** Stations 124, 173 b, and 255, and Husø (40—60 fathoms). Depth 40—350 fathoms.

*Cyclostrema basistriatum* is distributed all along the Norwegian coast from the Christiania Fjord to Lofoten and Vesterdaalen. It is further known from the North Atlantic, where it has been found by the 'Valorous', the 'Lightning', the 'Porcupine', and the 'Travailleur'. The southern limit of its distribution is at Portugal. It occurs moreover on the east coast of North America; and according to Jeffreys, it is also found in Spitsbergen. Its bathymetrical distribution is from 40 to 1333 fathoms. It is a fossil in Ficaragzi.

We have had an opportunity of comparing an original specimen of *Cyclostrema affine*, Verrill<sup>1)</sup>, with the *Cyclostrema basistriatum* occurring on the Norwegian coast. In both sculpturing and shape there was so great a resemblance that we can only regard them as identical. Judging from the type-specimen, Verrill's drawing seems to make it too slender. There is very little difference between *Cyclostrema affine* and *Cyclostrema diaphanum*, Verrill. The latter, however, has finer sculpturing round the umbilicus, more resembling in this respect *Cyclostrema rugulosum*. Not, however, having a specimen of Verrill's we will not venture to express any decided opinion on the subject.

We do not agree with W. H. Dall in regarding *C. affine* identical with *C. trochoide*, Jeff.<sup>2)</sup>.

### **Cyclostrema rugulosum**, (Jeffreys, M. S.), G. O. Sars.

*Cyclostrema rugulosum*, Jeffreys, m. s., G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 129 og 344, Pl. 21, fig. 1 a—b.

— — — Verrill, Trans. Connecticut Acad., vol. 5, 1882, p. 533.

— — — Jeffreys, Proc. Zool. Soc., 1883, p. 90.

**Findested.** Husø, 100 fv. og station 173 b, 300 fv.

*Cyclostrema rugulosum* er kjendt fra Norges vestkyst op til Lofoten, Færøkanalen, munden af Kanalen, Messina og New England. Den bathymetriske udbredelse er 80—539 fv. Fossil er den ifølge Seguenza funden ved Messina.

**Locality.** Husø (100 fathoms), and Station 173 b (300 fathoms).

*Cyclostrema rugulosum* occurs off the west coast of Norway up to Lofoten, in the Faroe Channel, at the mouth of the English Channel, off Messina and New England. Its bathymetrical distribution is from 80 to 539 fathoms. According to Seguenza, it is a fossil in Messina.

<sup>1)</sup> Trans. Connecticut Acad., vol. 6, 1884, p. 199, tab. 32, fig. 15.

<sup>2)</sup> Bull. o. the Museum of comp. Zool., vol. 18, p. 393.

<sup>1)</sup> Trans. Connecticut Acad., Vol. 6, 1884, p. 199, Pl. XXXII, fig. 15.

<sup>2)</sup> Bull. o. the Museum of comp. Zool., vol. 18, p. 393.

**Cyclostrema lævigatum** (Jeffreys, M. S.), G. O. Sars.

*Molleria lævigata*, Jeffreys, m. s., Friele, Christ. Vidensk. Selsk. Forhandl., 1875, p. 60.

*Cyclostrema lævigatum*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 130 og 344, Pl. 21, fig. 2 a—b.

*Molleria lævigata*, Jeffreys, Proc. Zool. Soc., 1883, p. 89.

**Findested.** Station 173 b, 300 fv.

Denne art er tidligere kjendt fra Shetlandsoerne, Færøkanalen og Norges vestkyst, hvor den er udbredt fra Bergen til Vesteraalen. Den bathymetriske udbredelse er 20—300 fv. Fossil er den funden paa Sicilien.

**Locality.** Station 173 b (300 fathoms).

This species was previously known from the Shetland Isles, the Faroe channel, and the west coast of Norway, where it ranges from Bergen to Vesteraalen. Its bathymetrical distribution is from 20 to 300 fathoms. It is a fossil in Sicily.

**Cyclostrema petterseni**, Friele.

*Cyclostrema petterseni*, Friele, Nyt Mag. f. Naturvidensk., vol. 23, 1877, p. 3, fig. 3.

— *trochoide*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 131, Pl. 8, fig. 9.

— var. *petterseni*, G. O. Sars, Op. cit., p. 344, Pl. 33, fig. 5.

— *petterseni*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 33, Pl. 11, figs. 15 og 16.

**Findested.** Stationerne 31, 173 b, 192 og 195. Dybde 107—649 fv.

Arten er udbredt langs Norges vestkyst fra Bergen til Vardø. Af Jeffreys blev den fundet paa „Porcupine“-expeditionen i 1870, men ikke beskrevet.

Den er ligeledes funden i Biskayerbugten, Palermo og Nordamerikas østkyst. Den bathymetriske udbredelse er 18—2033 fv.

**Locality.** Stations 31, 173 b, 192, and 195. Depth 107—649 fathoms.

This species is distributed along the west coast of Norway from Bergen to Vardø. It was first discovered by Jeffreys on the 'Porcupine' Expedition in 1870, but not described.

It is also found in the Bay of Biscay, off Palermo and off the east coast of North America. Its bathymetrical range is from 18 to 2033 fathoms.

**Cyclostrema areolatum**, G. O. Sars.

*Cyclostrema areolatum*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 344, Pl. 33, fig. 6 a—d.

— Jeffreys, Proc. Zool. Soc., 1883, p. 90

**Findested.** Station 173 b, 300 fv. og station 192, 649 fv.

Foruden fra Vesteraalen, hvorfra de af Sars beskrevne exemplarer skriver sig, er denne art kun kjendt fra Færøkanalen, hvor Lightningexpeditionen i 1868 erholdt to exemplarer.

**Locality.** Stations 173 b (300 fathoms), and 192 (649 fathoms).

Besides in Vesteraalen, whence came the specimens described by Sars, this species is known to occur only in the Faroe channel, where the 'Lightning' Expedition took two specimens in 1868.

**Cyclostrema millipunctatum**, Friele.

*Cyclostrema millipunctatum*, Friele, Nordhavs Exp., Moll., vol. 2, 1886, p. 33, Pl. 11, figs. 17, 18.

**Findested.** Station 192, 649 fv.

**Locality.** Station 192 (649 fathoms).

**Cyclostrema willei**, Friele.

*Cyclostrema willei*, Friele, Nordhavs Exp., Moll., vol. 2, 1886, p. 34, Pl. 11, fig. 19.

**Findested.** Station 173 b, 300 fv. og station 192, 649 fv.

**Locality.** Stations 173 b (300 fathoms), and 192 (649 fathoms).

**Cyclostrema profundum**, Friele.

*Cyclostrema profundum*, Friele, Jahrb. Deutsch. Mol. Gesellsch., vol. 6, 1879, p. 272.

— — Friele, Nordhavs Exp., Moll., vol. 2, 1886, p. 34, Pl. 11, figs. 20—22.

**Findested.** Stationerne 192, 353 og 357. Dybde 120—1333 fv.

**Locality.** Stations 192, 353, and 357. Depth 120—1333 fathoms.

**Margarita helicina**, Phipps.

*Turbo helycinus*, Phipps, Voy. towards the North-Pole, 1774, p. 198.

*Margarita arctica*, Middendorf, Reise in der aüss. Norden u. Øst Sib., 1851, p. 203, Pl. 17, figs. 13—16.

*Trochus helycinus*, Jeffreys, Brit. Conch., vol. 3, 1865, p. 295, vol. 5, p. 201, Pl. 61, fig. 4 a.

*Margarita helicina*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 132, Pl. III, figs. 7 og 8.

**Findested.** Station 312, 656 fv. (dødt exemplar); station 338, 148 fv. (dødt exemplar); Beeren Eiland, 18 fv.; Jan Mayen, 10—15 fv.; Norskøerne, 10—15 fv.; Magdalena Bay, 30—60 fv. og Advent Bay, 20—30 fv.

**Locality.** Stations 312 (656 fathoms; dead specimen) and 338 (148 fathoms; dead specimen), Bear Island (18 fathoms), Jan Mayen (10—15 fathoms), Norwegian Islands (10—15 fathoms), Magdalena Bay (30—60 fathoms, and Advent Bay (20—30 fathoms).

*Margarita helicina* er en circumpolar art, som er kjendt fra Grønland, Nordamerikas østkyst indtil Massachusetts, Nordeuropa indtil De britiske øer, Jan Mayen, Spitsbergen, Franz Josefsland, Novaja Semlja, Karahavet, Beringshavet, Okotske hav, Sitka og Vancouver. Den bathymetriske udbredelse er 0—100 fv. Fossil er den kjendt fra Skandinavien, Skotland, nordlige Rusland, Canada og Spitsbergen.

*Margarita helicina* is a circumpolar species, occurs off Greenland, the east coast of North America down to Massachusetts, Northern Europe as far south as the British Isles, Jan Mayen, Spitsbergen, Franz Josef Land, Novaja Semlja, in the Kara Sea, the Bering Sea, the Sea of Okhotsk, off Sitka, and Vancouver I. Its bathymetrical distribution is from 0 to 100 fathoms. It is a fossil in Scandinavia, Scotland, the north of Russia, Canada, and Spitsbergen.

**Margarita grønlandica**, Chemnitz.

*Trochus grønlandicus*, Chemnitz, Conch. Cab., vol. 5, 1781, p. 108, fig. 1671.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 298, vol. 5, p. 202, Pl. 61, fig. 5.

*Margarita grønlandica*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 133, Pl. III, fig. 9, Pl. XVIII, fig. 4.

**Findested.** Husø, 40 fv., Beeren Eiland, 18 fv., Jan Mayen, 30 fv., Norskøerne, 10—20 fv., Advent Bay, 20—30 fv., station 336, 70 fv. og station 359, 416 fv. (dødt exemplar).

**Locality.** Husø (40 fathoms), Bear Island (18 fathoms), Jan Mayen (30 fathoms), Norwegian Islands (10—20 fathoms), Advent Bay (20—30 fathoms), and Stations 336 (70 fathoms) and 359 (416 fathoms; dead specimen).

Den er circumpolar og har omtrent samme udbredelse som foregaaende. Den bathymetriske udbredelse er 0—150 fv. Fossil er den funden i Skandinavien, Britiske øer, nordlige Rusland, Spitsbergen, Sibirien og Grønland.

It is circumpolar, and has almost the same distribution as the preceding species. Its bathymetrical distribution is from 0 to 150 fathoms. It is a fossil in Scandinavia, the British Isles, the north of Russia, Spitsbergen, Siberia, and Greenland.



**Margarita umbilicalis**, Broderip & Sowerby.

*Margarita umbilicalis*, Broderip & Sowerby, Zool. Jour., vol. 4, 1829, p. 371.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 31, Pl. 11, figs. 22 & 23.

**Findested.** Jan Mayen, 10—15 fv. (ungt exemplar).  
Norskoerne, 10—20 fv., Magdalena Bay og Advent Bay,  
20—60 fv.

Denne art er kjendt fra Assistance Bay, Cumber-  
landsund, Grønland, Jan Mayen, Spitsbergen, Frants Jo-  
sefsland, Hvidehavet og Novaja Semlja. Den bathymetriske  
udbredelse er 2—150 fv.

**Locality.** Jan Mayen (10—15 fathoms; young speci-  
men), Norwegian Islands (10—20 fathoms), Magdalena Bay  
and Advent Bay (20—60 fathoms).

This species is known from Assistance Bay, Cumber-  
land Sound, Greenland, Jan Mayen, Franz Josef Land,  
the White Sea and Novaja Semlja. Its bathymetrical range  
is from 2 to 150 fathoms.

**Margarita vahlii**, Møller.

*Margarita vahlii*, Møller, Ind. Moll. Grøn., 1842, p. 8.

— Mart. Chemn. Conch. Cab., ed. 2, 1846, p. 286, Pl. 42, fig. 2.

*Trochus* — Jeffreys, Ann. Mag. Nat. Hist., ser. 4, vol. 19, p. 238.

**Findested.** Station 267, 140 fv.; station 338, 148  
fv. og Norskoerne, 15—20 fv.

Denne høiarktiske form er tidligere kjendt fra Assi-  
stance Bay, Grønland, Spitsbergen, Hvidehavet og Berings-  
havet. Den bathymetriske udbredelse er 2—300 fv.

**Locality.** Stations 267 (140 fathoms) and 338 (148  
fathoms), and the Norwegian Islands (15—20 fathoms).

This high-arctic form was previously known from  
Assistance Bay, Greenland, Spitsbergen, the White Sea,  
and Bering Sea. Its bathymetrical distribution is from 2  
to 300 fathoms.

**Margarita olivacea**, Brown.

*Turbo olivaceus*, Brown, Ill. Brit. Conch., 1827, Pl. 46, figs. 30 & 31.

*Trochus* — Jeffreys, Ann. Mag. Nat. Hist., ser. 4, vol. 19, 1877, p. 237.

*Margarita olivacea*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 134, Pl. 9, fig. 6 a—c, Pl. III, fig. 10.

**Findested.** Station 267, 148 fv., station 273, 197  
fv. og Tromsø, 5—10 fv.

*Margarita olivacea* er en circumpolar art, som er  
kjendt fra Grønland, Amerikas nord- og østkyst indtil Cape  
Cod, Nordeuropa indtil Hebriderne, Spitsbergen, Novaja  
Semlja, Karahavet, Sibiriens ishavskyster, St. Lawrence og  
Beringshavet. Ved den norske kyst gaar den ikke sonden-  
for Lofoten. Den bathymetriske udbredelse er 2—300 fv.  
Fossil er den funden ved Uddevalla og Greenock.

**Locality.** Stations 267 (148 fathoms) and 273 (197  
fathoms), and Tromsø (5—10 fathoms).

*Margarita olivacea* is a circumpolar species, known  
from Greenland, the north coast of North America, and  
the east coast down to Cape Cod, in Northern Europe as  
far south as the Hebrides, Spitsbergen, Novaja Semlja,  
the Kara Sea, the Arctic shores of Siberia, in the Gulf  
of St. Lawrence and the Bering Sea. On the Norwegian  
coast it is not found south of Lofoten. Its bathymetrical  
distribution is from 2 to 300 fathoms. It is a fossil at  
Uddevalla and Greenock.

**Margarita cinerea**, Couthouy.

*Turbo cinereus*, Couthouy, Boston, Jour. Nat. Hist., vol. 2, 1839, p. 99, Pl. 3, fig. 9.

*Trochus* — Jeffreys, Ann. Mag. Nat. Hist., ser. 4, vol. 19, 1877, p. 236.

*Margarita cinerea*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 134, Pl. 9, fig. 1, Pl. 21, fig. 4, Pl. III, fig. 11.

**Findested.** Stationerne 173 b (unge exemplarer), 262  
(døde skaller), 267, 273 (døde skaller), Hammerfest, 20 fv.  
og Norskoerne, 10—20 fv. Dybde 10—300 fv.

**Locality.** Stations 173 b (young specimens), 262  
(empty valves), 267, and 273 (empty valves), Hammerfest  
(20 fathoms) and the Norwegian Islands (10—20 fathoms).  
Depth 10—300 fathoms.

*Margarita cinerea* er ligeledes circumpolar og kjendt fra Grønland, Nordamerika indtil Cape Cod, Nordeuropa indtil Færøkanalen og Florø, Jan Mayen, Spitsbergen, Frants Josefsland, Novaja Semlja, Barentshavet, Karahavet, Sibirien, Beringshavet og Sitka. Den bathymetriske udbredelse er 2—300 fv. Fossil er den kjendt fra Skandinavien, Britiske øer, nordlige Rusland, Sibirien og Spitsbergen.

*Margarita cinerea* is also circumpolar, and occurs off Greenland, North America down to Cape Cod, Northern Europe down to the Faroe channel and Florø, Jan Mayen, Spitsbergen, Franz Josef Land, Novaja Semlja, the Barents Sea, the Kara Sea, Siberia, the Bering Sea and Sitka. Its bathymetrical distribution is from 2 to 300 fathoms. It is a fossil in Scandinavia, the British Isles, the north of Russia, Siberia, and Spitsbergen.

#### ***Margarita striata*, Broderip & Sowerby.**

*Margarita striata*, Broderip & Sowerby, Zool. Journ., vol. 4, 1829, p.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 31, Pl. 12, fig. 1.

*Margarita striata* forekommer ganske hyppig ved Magdalen Bay, 60 fv.

Dens udbredelse kan ikke med nøjagtighed angives, da mange forfattere slaar den sammen med foregaaende art. Den er angivet foruden fra Spitsbergen ogsaa fra Grønland og Beringshavet og saaledes circumpolar.

*Margarita striata* occurs rather frequently in Magdalen Bay (60 fathoms).

Its distribution cannot be given with accuracy, as many authors unite it with the preceeding species. It is reported from Spitsbergen and from Greenland and the Bering Sea and further is thus circumpolar species.

#### ***Margarita striata*, var. *margaritifera*, Friele.**

*Margarita striata*, var. *margaritifera*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 32, Pl. 12, figs. 2—3.

Denne sjeldne, vakre snække foreligger kun i to exemplarer fra station 124, 350 fv.

Only two specimens of this rare and beautiful shell were found at Station 124 (350 fathoms).

#### ***Machæroplax affinis*, Jeffreys m. s., Friele.**

*Trochus affinis*, Jeffreys, m. s., Friele, Christiania Vidensk. Selsk. Forhand., 1873, p. 15.

*Machæroplax*, — Friele, Arch. f. Math. og Naturvidensk., vol. 2, 1877, p. 313, Pl. 5, figs. 2 & 3.

I sit arbejde over „Tungebevæbningen hos de norske *Rhipidoglossa*“ har Friele opstillet slægten *machæroplax* for *trochus affinis* og nærstaaende former; i 2det bind af Nordhavsexpeditionens mollusker henfører han den derimod til slægten *solariella*, der opstilledes af Wood i 1842<sup>1)</sup>. Efter nøiere granskning af denne slægt er vi imidlertid nødsaget til paany at optage slægtsnavnet *machæroplax*. Ved en undersøgelse af Woods type for *solariella* (*s. maculata*) finder vi at denne ikke er nogen *machæroplax*, ja neppe nogen *margarita*. Som karakter for slægten *machæroplax* maa vi gjentage, at dyret har et fryndset mundseil. Radula har tandformelen, 1, 2 til 3—1, 5 til 10.

In his work on „Tungebevæbningen hos de norske *Rhipidoglossa*“, Friele established the genus *Machæroplax* for *Trochus affinis* and allied forms. In the second volume of the mollusca of the North Atlantic Expedition, he however refers it to the genus *Solariella*, which was established by Wood in 1842<sup>1)</sup>. After a careful examination of this genus, we feel compelled to return to the generic name, *Machæroplax*. We find that Wood's type of *Solariella* (*S. maculata*), is not a *Machæroplax* at all, perhaps not even a *Margarita*. We must repeat that as a characteristic feature of the genus *Machæroplax*, the animal has a fringed mouth-sail. The radula has the teeth-formula 1, 2 to 3—1, 5 to 10.

<sup>1)</sup> Ann. & Mag. Nat. Hist., vol. 9, 1842, p. 531, Pl. 5, fig. 7 & 10. I sin monografi over cragmolluskerne (vol. 1, 1848, p. 134), har Wood igjen strøget slægtsnavnet *solariella* og benytter istedet *margarita*. For formen *maculata* vedkommende er han dog i tvivl, hvorvidt den er en *margarita*.

<sup>1)</sup> Ann. & Mag. Nat. Hist., Vol. IX, 1842, p. 531, Pl. V, figs. 7 & 10. In his monograph on the Crag molluscs (Vol. I, 1848, p. 134), Wood has again rejected the generic name, *Solariella*, and substituted *Margarita*. With regard to the form *maculata*, however, he is doubtful whether it is a *Margarita*.

Af ovenstaaende vil det fremgaa, at vi er uenig med Jeffreys, naar han anser *solariella maculata* for synonym med *trochus cinctus*, Philippi<sup>1)</sup>.

*Machæroplax affinis* holder vi for en fra *trochus cinctus*, Philippi, *t. amabilis*, Jeffreys og *machæroplax hidalgoi*, Fischer, forskjellig form. Saavidt os bekjendt er formen *cinctus s. amabilis* ikke funden ved den norske kyst.

*Machæroplax affinis* foreligger i et par exemplarer fra station 79, 155 fv. Friele har tidligere taget den i Bergensfjorden, 180—200 fv. G. O. Sars har fundet den paa Storeggen.

#### **Machæroplax lævis, Friele.**

*Solariella lævis*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 30, Pl. 12, figs. 4—6.

**Findested.** Station 124, 350 fv. og station 173 b, 300 fv.

It will appear from the above that we differ from Jeffreys when he considers *Solariella maculata* to be synonymous with *Trochus cinctus*, Philippi<sup>1)</sup>.

We consider *Machæroplax affinis* to be a different species from *Trochus cinctus*, Philippi, *T. amabilis*, Jeffreys, and *M. hidalgoi*, Fischer. As far as we know, the form *cinctus s. amabilis* is not found on the Norwegian coast.

There are a few specimens of *Machæroplax affinis* from Station 79 (155 fathoms). Friele had previously found it in the Bergen Fjord (180—200 fathoms), and G. O. Sars has found it at Storeggen.

**Locality.** Stations 124 (350 fathoms) and 173 b (300 fathoms).

#### **Machæroplax obscura, Couthouy.**

*Turbo obscurus*, Couthouy, Jour. Boston Soc. Nat. Hist., vol. 2, 1838, p. 100, Pl. 3, fig. 12.

*Margarita obscura*, Gould, Rep. Invert. Mass., ed. 2, 1870, p. 283.

*Machæroplax* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 137, Pl. 9, fig. 5 a—c.

**Findested.** Stationerne 192, 223, 224, 326, 357 og Hammerfest, 20 fv. Dybde 20—649 fv.

*Machæroplax obscura* er kjendt fra Nordamerikas østkyst, Færøkanalen, Norges vest- og nordkyst, Murmankysten, Hvidehavet, Jan Mayen, Spitsbergen, Novaja Semlja, Karahavet, Sibirien, Aleuterne og Sitka. Den bathymetriske udbredelse er 2—1415 fv. Fossil er den funden i det nordlige Rusland og paa Novaja Semlja.

**Locality.** Stations 192, 223, 224, 326, and 357, and Hammerfest (20 fathoms). Depth 20—649 fathoms.

*Machæroplax obscura* is known from the east coast of N. America, the Faroe Channel, the west and north coast of Norway, the Murman Coast, the White Sea, Jan Mayen, Spitsbergen, Novaja Semlja, the Kara Sea, Siberia, the Aleutian Isles, and Sitka. Its bathymetrical distribution is from 2 to 1415 fathoms. It is a fossil in northern Russia and Novaja Semlja.

#### **Trochus occidentalis, Mighels & Adams.**

*Trochus occidentalis*, Mighels & Adams, Proc. Boston Soc. Nat. Hist., vol. 1, 1844, p. 49, Pl. 4, fig. 16.

— — Jeffreys, Brit. Conch., vol. 3, 1865, p. 333, vol. 5, p. 204, Pl. 73, fig. 7.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 142, Pl. 9, fig. 7, Pl. IV, fig. 5.

**Findested.** Husø, 40—60 fv., station 260, 127 fv. (dødt exemplar) og station 290, 191 fv.

*Trochus occidentalis* er udbredt langs vor vest- og nordkyst. Forøvrigt forekommer den fra Murmankysten og Færøerne til Dogger bank og Irlands vestkyst. Desuden er den kjendt fra Nordamerikas østkyst. Den anføres ogsaa fra Grønland, men skal denne angivelse ifølge Posselt være tvivlsom. Den bathymetriske udbredelse er 8—191 fv. Fossil er den kjendt fra England og Belgiens crag samt fra Messina.

**Locality.** Husø (40—60 fathoms), and Stations 260 (27 fathoms; dead specimen) and 290 (191 fathoms).

*Trochus occidentalis* is distributed along the west and north coasts of Norway. It also occurs from the Murman Coast and the Faroe Isles to the Dogger Bank and the west coast of Ireland, and off the east coast of N. America. It is further recorded from Greenland, but according to Posselt this statement is to be doubted. Its bathymetrical distribution is from 8 to 191 fathoms. It is known as a fossil in the crag of England and Belgium, and at Messina.

<sup>1)</sup> Proc. Zool. Soc., 1883, p. 97.

<sup>1)</sup> Proc. Zool. Soc., 1883, p. 97.



**Pilidium radiatum**, M. Sars.

*Capulus radiatus*, M. Sars, Nyt Mag. f. Naturvidensk. vol. 6, 1850, p. 184.

*Pilidium commodum*, Middendorf, Reise in aüss. Norden, 1851, p. 214, Pl. 17, figs. 4—11.

*radiatum*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 144, Pl. 8, fig. 6 a—d, Pl. V, fig. 1.

**Findested.** Stationerne 48, 124 (fragment), 164, 192 (dødt exemplar), 270 og 323. Dybde 136—457 fv. (649 fv.).

Denne eiendommelige art er hos os kun funden i Komagfjorden, Finnmarken. Forøvrigt er den kjendt fra Grønland, Nordamerikas østkyst, Island, Spitsbergen, Murmanskysten, Karahavet, Sibirien, Beringshavet, Aleuterne, Okotske hav og Japan. Den bathymetriske udbredelse er 12—457 fv. Fossil er den funden i Skandinavien, Britiske øer og Canada.

**Locality.** Stations 48, 124 (fragment), 164, 192 (dead specimen), 270 and 323. Depth 136—457 (649) fathoms

In Norway, this peculiar species has only been found in the Komag Fjord in Finmark. It occurs moreover off Greenland, the east coast of N. America, Iceland, Spitsbergen, the Murman Coast, in the Kara Sea, Siberia, the Bering Sea, the Aleutian Isles, the Sea of Okhotsk and Japan. Its bathymetrical distribution is from 12 to 457 fathoms. It is a fossil in Scandinavia, the British Isles, and Canada.

**Capulus hungaricus**, Linné.

*Patella ungarica*, Linné, Syst. Nat., ed. 12, 1767, p. 1259.

*Capulus hungaricus*, Jeffreys, Brit. Conch., vol. 3, 1865, p. 269, Pl. 6, fig. 5, vol. 5, p. 201, Pl. 59, fig. 6.

— — G. O. Sars, Moll. Reg. Arct. Norw., 1878, p. 145.

**Findested.** Stationerne 173 b, 192 og 195 (døde exemplarer). Dybde 107—649 fv.

*Capulus hungaricus* forekommer spredt langs hele den norske kyst op til Lofoten. Mod syd gaar den til Middelhavet og Adriaterhavet. Desuden forekommer den ved Nordamerikas østkyst. Den bathymetriske udbredelse er 0—994. Fossil er den funden i en større del af Europas tertiære lag.

**Locality.** Stations 173 b, 192 and 195 (dead specimens). Depth 107—649 fathoms.

*Capulus hungaricus* occurs sparsely all along the Norwegian coast up to Lofoten. It extends southwards to the Mediterranean and the Adriatic. It also occurs off the east coast of N. America. Its bathymetrical distribution is from 0 to 994 fathoms. It is a fossil in many of the Tertiary beds of Europe.

**Velutina lævigata**, Pennant.

*Helix lævigata*, Pennant, Brit. Zool., vol. 4, 1777, p. 122, Pl. 86, fig. 139

*Velutina* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 240, Pl. 3, fig. 7, vol. 5, p. 216, Pl. 79, fig. 4

G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 146, Pl. V, fig. 3.

**Findested.** Tromsø, Hammerfest, 20 fv., station 192, 649 fv. (døde skaller) og station 290, 191 fv.

Denne art er kjendt fra Grønland, Nordamerikas østkyst indtil Cape Cod, Nord- og Vesteuropa indtil Middelhavet, Spitsbergen, Novaja Semlja, Karahavet, Barentshavet, Sibirien, Beringsstrædet og Kamtschatka. Den bathymetriske udbredelse er 0—191 fv. Fossil er den funden i Skandinavien og Skotland.

**Locality.** Tromsø, Hammerfest (20 fathoms), and Stations 192 (649 fathoms; empty shells) and 290 (191 fathoms).

The distribution of this species is Greenland, the east coast of N. America down to Cape Cod, Northern and Western Europe as far as the Mediterranean, Spitsbergen, Novaja Semlja, the Kara Sea, the Barents Sea, Siberia, Bering Strait, and Kamtschatka. Its bathymetrical distribution is from 0 to 191 fathoms. It is a fossil in Scandinavia and Scotland.

**Velutina schneideri**, Friele.

*Velutina schneideri*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 26, Pl. 11, figs. 3 & 4.

**Findested.** Tromsø, 20 fv.

**Locality.** Tromsø (20 fathoms).

**Velutina lanigera**, Møller.

*Velutina lanigera*, Møller, Ind. Moll. Grøn., 1842, p. 10.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 146, Pl. 12, fig. 3 a—b.

**Findested.** Stationerne 280, 323, 336, 338 og Tromsø. 10—20 fv. Dybde 10—223 fv.

Ved den norske kyst er *velutina lanigera* ikke funden søndenfor Lofoten. Forøvrigt er den kjendt fra Grønland og Spitsbergen. Den bathymetriske udbredelse er 10—223 fv.

**Locality.** Stations 280, 323, 336, and 338, and Tromsø (10—20 fathoms). Depth 10—223 fathoms.

*Velutina lanigera* is not found on the Norwegian coast south of Lofoten. Other places where it occurs are Greenland and Spitsbergen. Its bathymetrical distribution is from 10 to 223 fathoms.

**Velutina zonata**, Gould.

*Velutina zonata*, Gould, Rep. Invert. Mass., 1841, p. 242, fig. 160.

*Morvillia undata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 147, Pl. 21, fig. 7 a—c, Pl. V, fig. 4.

**Findested.** Stationerne 192 (døde skaller), 260, 323, 363 (fragmenter) og Norskøerne. 10—20 fv. Dybde 10—649 fv.

Denne art er funden ved Christiansund, Lofoten og Finmarken. Desuden er den kjendt fra Grønland, Nordamerikas østkyst, nordlige Rusland, Spitsbergen, Barentshavet, Novaja Semlja, Sibirien og Beringshavet. Den bathymetriske udbredelse er 5—223 fv. Fossil er den funden i England og Canada.

**Locality.** Stations 192 (empty valves), 260, 323 and 363 (fragments), and the Norwegian Islands (10—20 fathoms). Depth 10—649 fathoms

This species is found off Christiansund, Lofoten and Finmark. It occurs moreover off Greenland, the east coast of N. America, in northern Russia, Spitsbergen, the Barents Sea, Novaja Semlja, Siberia, and the Bering Sea. Its bathymetrical distribution is from 5 to 223 fathoms. It is a fossil in England and Canada.

**Lamellaria latens**, O. F. Müller.

*Bulla latens*, O. F. Müller, Prodr. Fau. Dan., 1776, p. 242.

*Lamellaria* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 150, Pl. 12, fig. 4 a—c, Pl. V, fig. 6.

**Findested.** Husø, 40—60 fv. og station 173 b, 300 fv. Arten forekommer meget sparsomt paa 20—70 favnes dyb langs vor vest- og nordkyst. Udenfor Norge er den ikke med sikkerhed paatruffet.

**Locality.** Husø (40—60 fathoms) and Station 173 b (300 fathoms).

This species occurs very sparingly in depths of from 20 to 70 fathoms off the west and north coasts of Norway. It has not been met with with certainty out of Norway.

**Marsenina micromphala**, Bergh.

*Marsenina micromphala*, Bergh, Kgl. danske Vidensk. Selsk. Skr., ser. 5, vol. 3, 1853, p. 350, Pl. 4, figs. 1—17.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 151, Pl. 21, fig. 10 a—d.

**Findested.** Stationerne 192, 649 fv. og 290, 191 fv.

Arten er tidligere kjendt fra Grønland, Nordamerikas østkyst, Sibiriens ishavskyster og Norge, hvor den er funden ved Finmarken og Tromsø. Den bathymetriske udbredelse er 5—191 fv.

**Locality.** Stations 192 (649 fathoms) and 290 (191 fathoms).

The species has previously been found off Greenland, the east coast of N. America, the Siberian shores of the Arctic Ocean, and Norway, where it is met with in Finmark and Tromsø. Its bathymetrical distribution is from 5 to 191 fathoms.

**Onchidiopsis glacialis**, M. Sars.

*Lamellaria glacialis*, M. Sars, Nyt Mag. f. Naturvidensk., vol. 6, 1850, p. 185.

*Onchidiopsis grønlandica*, Bergh, Kgl. danske Vidensk. Selsk. Skr., ser. 5, vol. 3, 1853, p. 346, Pl. 2.

— *glacialis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 153, Pl. 12, fig. 6 a—c.

*Onchidiopsis glacialis* fandtes i store mængder i torske-maver ved Norskoerne (Spitsbergen). Arten er kjendt fra Finmarken, Murmankysten, Novaja Semlja, Karahavet, Spitsbergen og Grønland. Den bathymetriske udbredelse er 8—75 fv.

*Onchidiopsis glacialis* was found in great numbers in the stomachs of cod among the Norwegian Islands (Spitsbergen). The species is known from Finmark, the Murman Coast, Novaja Semlja, the Kara Sea, Spitsbergen, and Greenland. Its bathymetrical distribution is from 8 to 75 fathoms.

**Ampullina smithii**, Brown.

*Bulbus smithii*, Brown, 1838.

*Natica flava*, Gould, Rep. Invert. Mass., 1841, p. 239, fig. 162, ed. 2, 1870, p. 347.

— *aperta*, Lovén, Ind. Moll. Scand., 1846, p. 149.

*Ampullina smithii*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 155, Pl. 12, fig. 2, Pl. 21, fig. 18, Pl. V, fig. 9, Pl. XVIII, fig. 9.

**Findested.** Stationerne 195, 261, 290 (dødt exemplar), 323, 326 og 363 (dødt exemplar). Dybde 107—260 fv.

Denne art er tidligere kjendt fra Lofoten, Finmarken, Novaja Semlja, Karahavet, Beringshavet, Okotske hav og Nordamerikas østkyst. Den bathymetriske udbredelse er 20—260 fv. Fossil er den funden i England og det nordlige Rusland.

**Locality.** Stations 195, 261, 290 (dead specimen), 323, 326, and 363 (dead specimen). Depth 107—260 fathoms.

This species has previously been found off Lofoten, Finmark, Novaja Semlja, in the Kara Sea, the Bering Sea, the Sea of Okhotsk, and off the east coast of N. America. Its bathymetrical distribution is from 20 to 260 fathoms. It is a fossil in England and northern Russia.

**Amauropsis islandica**, Gmelin.

*Nerita islandica*, Gmelin, Syst. Nat., ed. 13, 1788, p. 3675.

*Natica* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 214, Pl. 78, fig. 1.

*Amauropsis islandica*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 156, Pl. 21, fig. 17, Pl. 5, fig. 10, Pl. XVIII, fig. 10.

**Findested.** Stationerne 173 b, 280, 322 og Norskoerne, 15—20 fv. Dybde 15—300 fv.

*Amauropsis islandica* er en circumpolar art, som er kjendt fra Grønland, det nordlige Amerika indtil Massachusetts, Nordeuropa indtil de Britiske øer og Kattegat, Jan Mayen, Spitsbergen, Novaja Semlja, Karahavet, Sibirien og Beringsstrædet. Ved den norske kyst er den ikke funden søndenfor Haugesund, den er dog meget sjelden ved vestkysten. Den bathymetriske udbredelse er 3—300 fv. Fossil er den funden i Skandinavien, Britiske øer, Canada, Sibirien, nordlige Rusland og Spitsbergen.

**Locality.** Stations 173 b, 280, and 322, and the Norwegian Islands (15—20 fathoms). Depth 15—300 fathoms.

*Amauropsis islandica* is a circumpolar species, occurring in Greenland, N. America down to Massachusetts; Northern Europe down to the British Isles and the Kattegat, off Jan Mayen, Spitsbergen, Novaja Semlja, in the Kara Sea, Siberia, and Bering Strait. It is not found on the Norwegian coast south of Haugesund but is very rare on the west coast. Its bathymetrical distribution is from 3 to 300 fathoms. It is a fossil in Scandinavia, the British Isles, Canada, Siberia, norther Russia and Spitsbergen.



**Natica, Lunatia, grønlandica, Beck.**

- Natica grønlandica*, Beck. Møller, Ind. Moll. Grønland, 1842, p. 7.  
 — — — — — Jeffreys. Brit. Conch., vol. 4, 1867, p. 216, vol. 5, p. 215, Pl. 78, fig. 2.  
*Lunatia* — — — — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 158, Pl. 21, fig. 15, Pl. V, fig. 13.  
*Natica* — — — — — Watson, Rep. Sci. Res. Challenger Exp., Zool., vol. 15, 1886, p. 447.

**Findested.** Stationerne 260, 261, 312, 315, 326, 338, 357, Hammerfest, 20 fv., Advent Bay og Magdalena Bay, 20—30 fv. Dybde 20—658 fv.

*Natica grønlandica* har sin sydgrænse inden Atlanterhavsområdet ved New England, Britiske øer, Ostende og Kattegat; inden Pacifikområdet gaar den mod syd til det nordlige Japan. Desuden er den funden af Challenger-expeditionen ved Heard Island, SSO af Kerguelen. Den bathymetriske udbredelse er 2—1290 fv. Fossil er den funden i Skandinavien, Britiske øer, Island, Spitsbergen, nordlige Rusland, Sibirien og Nordamerika.

**Locality.** Stations 260, 261, 312, 315, 326, 338, and 357, Hammerfest (20 fathoms), Advent Bay and Magdalena Bay (20—30 fathoms). Depth 20—658 fathoms.

The southern limit of *Natica grønlandica* in the Atlantic is at New England, the British Isles, Ostend, and the Kattegat, and in the Pacific at the north of Japan. It was also found by the 'Challenger' at Heard Island, SSE of Kerguelen Land. Its bathymetrical distribution is from 2 to 1290 fathoms. It is a fossil in Scandinavia, the British Isles, Iceland, Spitsbergen, northern Russia, Siberia, and N. America.

**Natica, Lunatia, pallida, Broderip & Sowerby.**

- Natica pallida*, Broderip & Sowerby, Zool. Journ., vol. 4, 1829, p. 372.  
 — — — — — Gray, Zool. Cap. Beechey's Voy., 1839, p. 136, Pl. 34, fig. 15.

**Findested.** Stationerne 223, 224, 225, 267, 366 og Magdalena Bay, 30 fv. Dybde 30—195 fv.

Ved skallets forholdsvis større længde og ved den høje, mere langstrakte mundaabning, afviger *natica pallida* saa meget fra *grønlandica*, at vi foretrækker at opretholde den som egen art. Da tegningen til „Blossom“-exemplaret er udført af Sowerby, og da han ligeledes deltog sammen med Gray i bearbejdelsen af de ved kaptein Beechey's reise indsamlede mollusker, er der al grund til at antage, at det afbildede exemplar er en typisk *natica pallida*, Broderip & Sowerby.

**Locality.** Stations 223, 224, 225, 267 and 366, and Magdalena Bay (30 fathoms). Depth 50—195 fathoms.

*Natica pallida* differs so greatly from *grønlandica* in its comparatively greater length, and its more elongated aperture, that we prefer to retain it as a separate species. As the drawing of the 'Blossom' specimen is by Sowerby, and as that writer also collaborated with Gray in the classification of the Mollusca collected during Captain Beechey's voyage, there is every reason to suppose that the specimen depicted is a typical *Natica pallida*, Broderip & Sowerby.

**Natica, Lunatia, nana, Møller.**

- Natica nana*, Møller, Ind. Moll. Grønland, 1842, p. 7.  
*Lunatia* — — — — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 159, Pl. 21, fig. 16, Pl. V, fig. 14.  
 — — — — — Verrill, Trans. Conn. Acad., vol. 5, 1882, p. 516, Pl. 42, fig. 9.

Denne art foreligger kun i nogle faa exemplarer fra Norskoerne, 10—20 fv.

Hos os er *natica nana* blot tagen ved Vardø og Vadsø. Forøvrigt er den kjendt fra Murmankysten, Hvidehavet, Spitsbergen, Grønland, New England, St. Lawrencebugten og Aleuterne. Porcupineexpeditionen har faaet et par døde skaller ved Skotlands vestkyst, Caudan har den fra Biskayerbugten og Talisman fra Nordafrikas vestkyst. Den bathymetriske udbredelse er 10—910 fv.

There are only a few specimens of this species, from the Norwegian Islands (10—20 fathoms).

In Norway, *Natica nana* has only been found at Vardø and Vadsø. It further occurs off the Murman Coast, in the White Sea, off Spitsbergen, Greenland, New England, the Gulf of St. Lawrence, and the Aleutian Isles. The 'Porcupine' Expedition found a few empty valves on the west coast of Scotland; the 'Caudan' found it in the Bay of Biscay, and the 'Talisman' off the north-west coast of Africa. Its bathymetrical distribution is from 10 to 910 fathoms.

**Natica affinis**, Gmelin

*Nerita affinis*, Gmelin, Syst. Nat., ed. 13, 1788, p. 3675.

*Natica* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 229, vol. 5, p. 215, Pl. 102, fig. 3.

— *clausa* & *affinis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 159 & 160, Pl. 21, figs. 12—14, Pl. V, figs. 15 & 16, Pl. XVIII, fig. 12.

— *affinis*, Watson, Rep. Sci. Res. Challenger Exp., Zool., vol. 15, 1886, p. 430.

**Findested.** Stationerne 1, 79, 149, 173 b, 192, 224, 225, 260, 261, 290, 338, 357, 359, 363, Husø, 200 fv., Norskoerne, 10—20 fv., Advent Bay, 20—40 fv. og Magdalena Bay, 20—60 fv. Dybde 10—650 fv.

Varieteten *occlusa*, S. V. Wood, foreligger fra station 280, 35 fv. og station 322, 21 fv.

*Natica affinis* er circumpolar. Inden Atlanterhavs-området har den sin sydgrænse ved New England og Middelhavet og inden Pacifikkomraadet ved det nordlige Japan og Vancouver. Den bathymetriske udbredelse er 0—1415 fv. Fossil er den kjendt fra Skandinavien, Britiske øer, Sicilien, Island, Rusland, Spitsbergen, Sibirien, Nordamerika og Grønland.

**Locality.** Stations 1, 79, 149, 173 b, 192, 224, 225, 260, 261, 290, 338, 357, 359 and 363, Husø (200 fathoms), the Norwegian Islands (10—20 fathoms), Advent Bay (20—40 fathoms), and Magdalena Bay (20—60 fathoms). Depth 10—650 fathoms.

Var. *occlusa*, S. V. Wood, was found at Stations 280 (35 fathoms) and 322 (21 fathoms).

*Natica affinis* is a circumpolar species. Its southern limit in the Atlantic is at New England and the Mediterranean, and in the Pacific at northern Japan and Vancouver Isle. Its bathymetrical distribution is from 0 to 1415 fathoms. It is known as a fossil in Scandinavia, the British Isles, Sicily, Iceland, Russia, Spitsbergen, Siberia, N. America, and Greenland.

**Natica bathybii**, Friele.

*Natica bathybii*, Friele, Jahrb. Deutsch. Mal. Gesellsch., vol. 6, 1879, p. 272.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 26, Pl. 11, figs. 1 & 2.

**Findested.** Stationerne 51, 240 (fragmenter), 251, 303, 312 og 353. Dybde 634—1333 fv. Exemplarerne tilhører dels den typiske form, dels var. *oblonga*, som har spiret mere hævet.

**Locality.** Stations 51, 240 (fragments), 251, 303, 312, and 353. Depth 634—1333 fathoms. Some of the specimens belong to the typical form, some to var. *oblonga*, in which the spire is more elevated.

**Torellia vestita**, Jeffreys.

*Torellia vestita*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 244, Pl. 4, fig. 1, Pl. 79, fig. 5.

— — Friele, Christiania Vidensk. Selsk. Forhandl., 1875, p. 62, Pl. 1, fig. 8.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 162, Pl. 22, fig. 1, Pl. VI, fig. 1, Pl. XVIII, fig. 14.

**Findested.** Stationerne 18, 31, 255 og 357. Dybde 125—417 fv.

*Torellia vestita* er udbredt langs Norges vestkyst fra Stavanger til Lofoten. Forøvrigt er den kjendt fra Færokanalen, Shetlandsoerne, Irlands vestkyst og Nordamerikas østkyst. Den bathymetriske udbredelse er 50—1380 fv.

**Locality.** Stations 18, 31, 255, and 357. Depth 125—417 fathoms.

*Torellia vestita* is distributed along the west coast of Norway from Stavanger to Lofoten. It is also known to occur in the Faroe Channel, off the Shetland Isles, the west coast of Ireland, and the east coast of N. America. Its bathymetrical distribution is from 50 to 1380 fathoms.

**Trichotropis borealis**, Broderip & Sowerby.

*Trichotropis borealis*, Broderip & Sowerby, Zool. Journ., vol. 4, 1829, p. 395.

— — — Jeffreys, Brit. Conch., vol. 4, 1867, p. 245, Pl. 4, fig. 2, vol. 5, p. 216, Pl. 79, fig. 6.

— — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 163, Pl. VI, fig. 2, Pl. XVIII, fig. 13.

**Findested.** Stationerne 173 b, 260, 267, 273, 290, 323 og Hammerfest, 20 fv. Dybde 20—300 fv.

*Trichotropis borealis* er en circumpolar art, som er kjendt fra Grønland, Nordamerikas østkyst, Nordenropa indtil Dogger Bank og kysten af Irland, Novaja Semlja, Karahavet og Beringshavet. Den bathymetriske udbredelse er 2—397 fv. Fossil er den funden i Skandinavien, Britiske øer, Sicilien, Sibirien, Canada og Labrador.

**Locality.** Stations 173 b, 260, 267, 273, 290, and 323, and Hammerfest (20 fathoms). Depth 20—300 fathoms.

*Trichotropis borealis* is circumpolar, known from Greenland, the east coast of N. America, and Northern Europe down to the Dogger Bank and the coast of Ireland, from Novaja Semlja, the Kara Sea, and the Bering Sea. Its bathymetrical distribution is from 2 to 397 fathoms. It is a fossil in Scandinavia, the British Isles, Sicily, Siberia, Canada, and Labrador.

**Trichotropis conica**, Møller.

*Trichotropis conica*, Møller, Ind. Moll. Grøn., 1842, p. 12.

— — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 163, Pl. 13, fig. 3.

**Findested.** Stationerne 173 b, 195, 237, 260, 290 og Alten, 30 fv. Dybde 30—300 fv.

Denne art er tidligere kun kjendt fra Finmarken, Jan Mayen, Novaja Scotia og Grønland. Den bathymetriske udbredelse er 15—300 fv.

**Locality.** Stations 173 b, 195, 237, 260, and 290, and Alten (30 fathoms). Depth 30—300 fathoms.

This species has formerly only been found in Finmark, Jan Mayen, Nova Scotia, and Greenland. Its bathymetrical distribution is from 15 to 300 fathoms.

**Trichotropis krøyeri**, Philippi.

*Trichotropis krøyeri*, Philippi, Zeitschr. f. Mal., 1845, p. 175.

*Cancellaria(?) arctica*, Middendorf, Mal. Ross., vol. 2, 1849, p. 112, Pl. 9, figs. 11, 12 & 15.

*Trichotropis dolium*, Petit, Jour. de Conch., vol. 2, 1851, p. 20.

Et større og et mindre exemplar fandtes ved Magdalena Bay, 20 fv. Det større exemplar havde en længde af 32 mm. og en bredde af 19 mm. Mundaabningens høide 22 mm.

Foruden fra Spitsbergen er *trichotropis krøyeri* kjendt fra Novaja Semlja, Karahavet, Beringshavet og polarhavet nord for dette. Den bathymetriske udbredelse er 5—20 fv.

One large, and one small specimen were found in Magdalena Bay (20 fathoms). The larger specimen was 32 mm. in length, and 19 mm. in breadth. Height of aperture 22 mm.

In addition to Spitsbergen, *Trichotropis krøyeri* is known from Novaja Semlja, the Kara Sea, the Bering Sea and the polar sea north of it. Its bathymetrical distribution is from 5 to 20 fathoms.

**Lacuna divaricata**, Fabricius.

*Trochus divaricatus*, Fabricius, Fau. Grøn., 1780, p. 392.

*Lacuna divaricata*, Jeffreys, Brit. Conch., vol. 3, 1865, p. 346, Pl. 8, fig. 2, vol. 5, p. 204, Pl. 64, fig. 3.

— — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 169, Pl. 21, fig. 22, Pl. VI, fig. 7.

**Findested.** Station 322, 21 fv.

Denne art forekommer ved Grønland, nordlige Amerika indtil New England, Nord- og Vesteuropa indtil Gascognerbugten, Beringshavet, Alaska og Japan. Den bathy-

**Locality.** Station 322 (21 fathoms).

This species occurs off Greenland, and N. America down to New England, Northern and Western Europe down to the Bay of Biscay, in the Bering Sea, Alaska, and Japan.



metriske udbredelse er 0—35 fv. Fossil er den funden i Skandinavien, Britiske øer, nordlige Rusland og Spitsbergen. Ifølge Melvill & Standen skal der ved Frants Josefsland forekomme en varietet af denne art.

Its bathymetrical distribution is from 0 to 35 fathoms. It is a fossil in Scandinavia, the British Isles, northern Russia, and Spitsbergen. According to Melvill & Standen, a variety of this species occurs in Franz Josef Land.

#### **Lacuna crassior, Montagu.**

*Turbo crassior*, Montagu, Test. Brit., 1803, p. 309, Pl. 20, fig. 1.

*Lacuna* — Jeffreys, Brit. Conch., vol. 3, 1865, p. 344, Pl. 64, fig. 2.

Et med vel bevaret epidermis dødt exemplar fandtes paa station 353, 1333 fv. I Frieles fortegnelse over Spitsbergens mollusker er den ved en feilskrift anført som *lacuna divaricata*.

*Lacuna crassior* er kendt fra Grønland, St. Lawrencebugten, Nordfrankrig, Britiske øer, Spitsbergen, nordlige Rusland, Okotske hav og Sitka. Den bathymetriske udbredelse er 0—25 fv. Fossil er den funden ved Hull og Belfast. Med hensyn til artens forekomst paa det ovennævnte paafaldende dyb, 1333 fv., har vi nærmere udtalt os herom i indledningen.

A dead specimen with well-preserved epidermis was found at Station 353 (1333 fathoms). In Friele's list of the Mollusca of Spitsbergen, it is entered by mistake as *Lacuna divaricata*.

The distribution of *L. crassior* is Greenland, the Gulf of St. Lawrence, the north of France, the British Isles, Spitsbergen, northern Russia, the Sea of Okhotsk, and Sitka. Its bathymetrical distribution is from 0 to 25 fathoms. It is found as a fossil at Hull and Belfast. With regard to the occurrence of this species at the above mentioned remarkable depth of 1333 fathoms, we have expressed ourselves more fully in the introduction.

#### **Hydrobia ulvæ, Pennant.**

*Turbo ulvæ*, Pennant, Brit. Zool., vol. 4, 1777, p. 132, Pl. 86, fig. 120.

*Hydrobia* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 52, vol. 5, p. 208, Pl. 69, fig. 1.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 170, Pl. 22, fig. 2.

**Findested.** Station 255, 341 fv. Da *hydrobia ulvæ* er en ren litoral art, er exemplaret antagelig af strømmen ført ud paa dybet.

Ved den norske kyst har denne art sin nordgrænse ved Kjosen. Forøvrigt anføres den fra Murmankysten og Hvidehavet. Mod syd gaar den til Middelhavet og Madeira. Ifølge Carpenter skal den ligeledes forekomme ved Kalifornien. Fossil er den kendt fra Skandinavien, nordlige Rusland, Britiske øer, Italien og Rhodes.

**Locality.** Station 255 (341 fathoms). As *Hydrobia ulvæ* is a litoral species, this specimen has probably been carried out into deep water by the current.

On the Norwegian coast, this species has its northern limit at Kjosen (Tromsø). It is also recorded from the Murman Coast and the White Sea. It extends southwards to the Mediterranean and Madeira. According to Carpenter, it also occurs in California. It is a fossil in Scandinavia, northern Russia, the British Isles, Italy and Rhodes.

#### **Rissoa membranacea, Adams.**

*Turbo membranaceus*, Adams, Trans. Linn. Soc., vol. 5, 1800, p. 2, Pl. 1, figs. 12 & 13.

*Rissoa membranacea*, Lovén, Ind. Moll. Scand., 1846, p. 24.

— — Jeffreys, Brit. Conch., vol. 4, 1867, p. 30, vol. 5, p. 208, Pl. 67, fig. 8.

**Findested.** Station 173 b, 300 fv. (dødt exemplar).

*Rissoa membranacea* er udbredt langs Norges vestkyst op til Vesteraalen. Mod syd gaar den til Middelhavet, Adriaterhavet, Sortehavet og Canariske øer. Den bathymetriske udbredelse er 0—600 fv. Fossil er den funden i Skandinavien, Britiske øer, Sydfrankrig og Rhodes.

**Locality.** Station 173 b (300 fathoms; dead specimen).

*R. membranacea* is distributed along the west coast of Norway up to Vesteraalen. It extends southwards to the Mediterranean, the Adriatic, the Black Sea and the Canary Isles. Its bathymetrical distribution is from 0 to 600 fathoms. It is a fossil in Scandinavia, the British Isles, the south of France, and Rhodes.

**Rissoa parva, var. interrupta, Adams.**

*Turbo interruptus*, Adams, Trans. Linn. Soc., vol. 5, 1800, p. 3, Pl. 1, figs. 16 & 17.

*Rissoa interrupta*, G. O. Sars, Moll. Reg. Arct. Norv. 1878, p. 180, Pl. 10, figs. 9 & 10.

— *parva* var. *interrupta*, Jeffreys, Proc. Zool. Soc., 1884, p. 118.

**Findested.** Beeren Eiland, 18 fv.

Arten er udbredt fra Murmankysten til Middelhavet, Adriaterhavet, Madeira og Canariske øer. Inden den arktiske region er det dog blot varieteten *interrupta*, som optræder. Den bathymetriske udbredelse er 0—1785 fv. Denne sidstnævnte dybde er angivet af „Travailleur“, men gjælder neppe levende eksemplarer. Fossil er den funden i Skandinavien, Britiske øer, Frankrig, Italien og Rhodes.

**Locality.** Bear Island (18 fathoms).

This species is distributed from the Murman Coast to the Mediterranean, the Adriatic, Madeira, and the Canary Isles. In the arctic regions, however, only the variety *interrupta* occurs. Its bathymetrical distribution is from 0 to 1785 fathoms. This last mentioned depths is noted by 'Travailleur', but does scarcely refer to living specimens. It is a fossil in Scandinavia, the British Isles, France, Italy, and Rhodes.

**Rissoa albella, var. sarsii, Lovén.**

*Rissoa sarsii*, Lovén, Ind. Moll. Scand., 1846, p. 25.

— *albella* var. *sarsii*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 29.

**Findested.** Bodø, 20 fv.

Denne form er foruden fra Norges vestkyst kjendt fra Shetlandsøerne, Danmark og Middelhavet.

**Locality.** Bodø (20 fathoms).

In addition to the Norwegian coast, this form is found in the Shetland Isles, Denmark, and the Mediterranean.

**Rissoa wyville-thomsoni, (Jeffreys, m. s.) Friele.**

*Rissoa wyville-thomsoni*, Jeffreys, m. s., Friele, Nyt Mag. for Naturvidensk., vol. 23, 1877, p. 3.

— — — Jeffreys, Proc. Zool. Soc., 1884, p. 122.

**Findested.** Stationerne 33, 53, 87, 240, 251, 267, 273, 312, 326, 338, 357 og 362. Dybde 123—1004 fv.

Foruden af „Voringen“ er denne tagen af „Lightning“ og „Porcupine“ i Færøkanalen. Fossil er den funden i England. Den er en af de hyppigst forekommende arter i det arktiske hav.

**Locality.** Stations 33, 53, 87, 240, 251, 267, 273, 312, 326, 338, 357 and 362. Depth 123—1004 fathoms.

This species has been found besides by the 'Voringen', also by the 'Lightning' and the 'Porcupine' in the Faroe Channel. It is a fossil in England. It is one of the species most frequently met with in the Arctic Ocean.

**Rissoa verrilli, Friele.**

*Rissoa verrilli*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 27, Pl. 11, fig. 5.

**Findested.** Station 192, 649 fv.

**Locality.** Station 192 (649 fathoms).

**Rissoa, Alvania, scrobiculata, Møller.**

*Rissoa scrobiculata*, Møller, Ind. Moll. Grøn., 1842, p. 9.

— — — Jeffreys, Proc. Roy. Soc., vol. 25, 1876, p. 192.

**Findested.** Stationerne 224, 267, 270, 290 og Advent Bay, 30 fv. Dybde 30—190 fv.

Arten er tidligere kjendt fra Grønland og Spitsbergen.

**Locality.** Stations 224, 267, 270, and 290, and Advent Bay (30 fathoms). Depth 30—190 fathoms.

This species is formerly known from Greenland and Spitsbergen.

**Rissoa, Alvania, cimicoides, Forbes.**

*Rissoa cimicoides*, Forbes, Rep. Brit. Assoc., 1843, p. 189.

Jeffreys, Brit. Conch., vol. 4, 1867, p. 14, vol. 5, p. 207, Pl. 66, fig. 6.

*Alvania* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 176, Pl. 10, fig. 4.

**Findested.** Stationerne 173 b, 195 og 255. Dybde 107—341 fv.

*Rissoa cimicoides* er udbredt fra Hammerfest og Færo-kanalen til Middelhavet, Adriaterhavet og Azorerne. Ifølge Jeffreys skal den ogsaa forekomme ved Grønland. Den bathymetriske udbredelse er 2—816 fv. Fossil er den funden i Norge, Britiske øer, Frankrig, Italien og Madeira.

**Locality.** Stations 173 b, 195, and 255. Depth 107—341 fathoms.

*R. cimicoides* is distributed from Hammerfest and the Faroe Channel to the Mediterranean, the Adriatic, and the Azores. According to Jeffreys, it also occurs in Greenland. Its bathymetrical distribution is from 2 to 816 fathoms. It is a fossil in Norway, the British Isles, France, Italy and Madeira.

**Rissoa, Alvania, syngenes, Verrill.**

*Cingula syngenes*, Verrill, Trans. Con. Acad., vol. 6, 1884, p. 180, Pl. 32, fig. 11.

**Findested.** Station 192, 649 fv.

Denne art, der i form og ydre karakter minder nærmest om *rissoa cimicoides*, men har en finere struktur, er ny for Europas fauna. Tidligere er den kun kjendt fra Cape Hatteras, 142 fv.

**Locality.** Station 192 (649 fathoms).

This species, which most resembles *R. cimicoides* in shape and external characters, but is of a more delicate structure, is new to the fauna of Europe. It has hitherto been found only off Cape Hatteras (142 fathoms).

**Rissoa, Alvania, jeffreysi, Waller.**

*Rissoa jeffreysi*, Waller, Ann. Mag. Nat. Hist., ser. 3, vol. 14, 1864, p. 136.

— Jeffreys, Brit. Conch., vol. 4, 1867, p. 15, vol. 5, p. 207, Pl. 66, fig. 7.

*Alvania* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 175, Pl. 10, fig. 3.

**Findested.** Stationerne 10, 173 b, 192, 195, 255 og Husø, 100 fv. Dybde 100—649 fv.

*Rissoa jeffreysi* forekommer paa de større dyb langs hele den norske kyst. Mod syd gaar den til Middelhavet. Den bathymetriske udbredelse er 40—816 fv. Fossil er den kjendt fra Norge, Italien og Murmankysten(?).

**Locality.** Stations 10, 173 b, 192, 195 and 255, and Husø (100 fathoms). Depth 100—649 fathoms.

*R. jeffreysi* occurs in deep water all along the Norwegian coast; and it extends southwards to the Mediterranean. Its bathymetrical distribution is from 40 to 816 fathoms. It is a fossil in Norway and Italy, and on the Murman Coast(?).

**Rissoa, Alvania, subsoluta, Aradas.**

*Rissoa subsoluta*, Aradas, Mem. Moluc. Sic., vol. 3, 1847, p. 21.

*Alvania abyssicola*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 177, Pl. 10, fig. 7.

— *subsoluta*, Norman, Ann. Mag. Nat. Hist., ser. 6, vol. 12, 1893, p. 357.

**Findested.** Stationerne 192, 195, 255 og 261. Dybde 107—649 fv.

*Rissoa subsoluta* er udbredt langs Europas vestkyst fra Lofoten til Middelhavet. Dens bathymetriske udbredelse er 107—1073 fv. Fossil er den funden ved Messina.

**Locality.** Stations 192, 195, 255, and 261. Depth 107—649 fathoms.

*R. subsoluta* is distributed along the west coast of Europe, from Lofoten to the Mediterranean. Its bathymetrical distribution is from 107 to 1073 fathoms. It is a fossil at Messina.



**Rissoa, Alvania, punctura, Montagu.**

*Turbo punctura*, Montagu, Test. Brit., 1808, p. 320, Pl. 12, fig. 5.

*Rissoa* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 17, vol. 5, p. 207, Pl. 66, fig. 8.

*Alvania* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 177, Pl. 10, fig. 6.

**Findested.** Station 173 b, 300 fv. (døde skaller) og station 195, 107 fv.

*Rissoa punctura* er udbredt fra Vestfinmarken og Færøerne til Middelhavet, Adriaterhavet og Kanariske øer. Den bathymetriske udbredelse er 0—130 fv. Fossil er den funden i Skandinavien, Britiske øer, Frankrig, Italien og Rhodes.

**Locality.** Stations 173 b (300 fathoms; empty shells) and 195 (107 fathoms).

*R. punctura* is distributed from West Finmark and the Faroe Isles, to the Mediterranean, the Adriatic, and the Canary Isles. Its bathymetrical distribution is from 0—130 fathoms. It is a fossil in Scandinavia, the British Isles, France, Italy, and Rhodes.

**Rissoa, Alvania, zetlandica, Montagu.**

*Turbo zetlandicus*, Montagu, Trans. Linn. Soc., vol. 11, 1815, p. 194, Pl. 13, fig. 3.

*Rissoa zetlandica*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 20, vol. 5, p. 207, Pl. 67, fig. 1.

*Alvania* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 177, Pl. 10, fig. 7.

**Findested.** Station 173 b, 300 fv.

Arten er udbredt fra Lofoten og Færøkanalen til Middelhavet. Den bathymetriske udbredelse er 12—1095 fv. Fossil er den funden i Norge, Britiske øer, Italien og Wienerbækkenet.

**Locality.** Station 173 b (300 fathoms).

This species is ranging from Lofoten and the Faroe Channel, to the Mediterranean. Its bathymetrical distribution is from 12 to 1095 fathoms. It is a fossil in Norway, the British Isles, Italy, and the Vienna basin.

**Rissoa, Alvania, jan mayeni, Friele.**

*Rissoa jan mayeni*, Friele, Nyt Mag. for Naturvidensk., vol. 24, 1878, p. 224, Pl. 1, fig. 4.

— *sibirica*, Leche, Kgl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 38, Pl. 1, fig. 10.

— *jan mayeni*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 27, Pl. 11, fig. 6 & 7.

**Findested.** Stationerne 223, 224, 225, 238, 267, 270, 273, 326, 336 og 357. Dybde 70—197 fv.

Arten er kjendt fra Murmankysten, Hvidehavet og Kariske hav. Den anføres desuden fra Grønland (Posselt), men da de grønlandske eksemplarer har betydelig stærkere skulptur, tilhører de øiensynlig den amerikanske form, *Cingula jan-mayeni*, Verrill, for hvilken Friele har foreslaet navnet *americana*. *Rissoa jan-mayeni* er overmaade talrig i det arktiske havs middelstore dyb.

**Locality.** Stations 223, 224, 225, 238, 267, 270, 273, 326, 336, and 357. Depth 70—197 fathoms.

This species occurs off the Murman Coast, in the White Sea and the Kara Sea. It is also recorded from Greenland (Posselt), but as the Greenland specimens have a much more marked sculpturing, they evidently belong to the American form, *Cingula jan-mayeni*, Verrill, for which Friele has proposed the name *americana*. *R. jan-mayeni* is exceedingly numerous in the medium depths of the Arctic Ocean.

**Rissoa, Onoba, striata, Adams.**

*Turbo striatus*, Adams, Trans. Linn. Soc., vol. 3, 1797, p. 66, Pl. 13, fig. 25 & 26.

*Rissoa striata*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 37, vol. 5, p. 208, Pl. 58, fig. 2.

*Onoba* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 172, Pl. 22, fig. 3.

**Findested.** Station 173 b, 300 fv. og station 192, 649 fv. (døde eksemplarer). Var. *aculeata*, Gould, s. *arctica*, Lovén toges ved Vardo.

**Locality.** Stations 173 b (300 fathoms) and 192 (649 fathoms; dead specimens). Var. *aculeata*, Gould, s. *arctica*, Lovén, was found at Vardo.

*Rissoa striata* er udbredt fra Murmankysten og Spitsbergen til Middelhavet, Madeira og Canariske øer. Desuden forekommer den ved Grønland, Nordamerikas østkyst og Okotske hav. Inden den arktiske region og ved Nordamerika er det dog blot varieteten *aculeata* som optræder. Den bathymetriske udbredelse er 0—649 fv. Fossil er den funden i Skandinavien, nordlige Rusland, Britiske øer og Italien.

*R. striata* is distributed from the Murman Coast and Spitsbergen, to the Mediterranean, Madeira, and the Canary Isles. It also occurs off Greenland, the east coast of N. America, and in the Sea of Okhotsk. In the arctic regions and in N. America, however, it is only the variety *aculeata* that appears. Its bathymetrical distribution is from 0 to 649 fathoms. It is a fossil in Scandinavia, northern Russia, the British Isles, and Italy.

#### **Rissoa, Onoba, castanea, Møller.**

*Rissoa castanea*, Møller, Ind. Moll. Grønl., 1842, p. 9.

*Cingula* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 174, Pl. 10, fig. 1.

**Findested.** Norskøerne, 20—30 fv. og Advent Bay, 30—40 fv.

Denne art er kjendt fra Grønland, Labrador, St. Lawrencebugten, New Brunswick, Island, Spitsbergen, Frants Josefs land, Murmankysten, Novaja Semlja, Okotske hav. Hos os er den kun funden ved Vadsø. Den bathymetriske udbredelse er 5—120 fv. Saavidt vi kan dømme af det materiale, som har staaet os til tjeneste, kan neppe *rissoa arenaria*, Mighels, holdes ud fra denne art. Ligeledes er *paludinella cingulata*, Middendorf, synonym.

**Locality.** The Norwegian Islands (20—30 fathoms) and Advent Bay (30—40 fathoms).

This species is known from Greenland, Labrador, the Gulf of St. Lawrence, New Brunswick, Iceland, Spitsbergen, Franz Josef Land, the Murman Coast, Novaja Semlja, and the Sea of Okhotsk. In Norway it is only found at Vadsø. Its bathymetrical distribution is from 5 to 120 fathoms. As far as we can judge from the material at our disposal, *R. arenaria*, Mighels, can scarcely be kept separate from this species; and *Paludinella cingulata*, Middendorf, is also synonymous with it.

#### **Rissoa, Cingula, turgida, Jeffreys.**

*Rissoa turgida*, Jeffreys, Ann. Mag. Nat. Hist., ser. 4, vol. 5, 1870, p. 445.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 183, Pl. 10, fig. 12.

— *semipellucida*, Friele, Jahrb. Deutsch. Mal. Gesellsch., vol. 6, 1879, p. 274.

**Findested.** Stationerne 192, 267, 353 og Husø, 100 fv. Dybde 100—1333 fv. Exemplarerne fra station 192 og 353 er fuldstændig glat (var. *lævier*).

Denne ægte dybvandsform er udbredt langs den norske kyst fra Christianiafjorden til Nordkap. Forøvrigt er den udbredt langs Vesteuropa indtil Gibraltar samt ved New England. Den bathymetriske udbredelse er 40—1333 fv. Fossil er den funden paa Sicilien og Calabrien.

**Locality.** Stations 192, 267, and 353, and Husø (100 fathoms). Depth 100—1333 fathoms. The specimens from Stations 192 & 353 are quite smooth (var. *lævier*).

This true deep-water form is distributed along the Norwegian coast from the Christiania Fjord to the North Cape, and also along the coast of Western Europe down to Gibraltar, and in New England. Its bathymetrical distribution is from 40 to 1333 fathoms. It is a fossil in Sicily and Calabria.

#### **Rissoa, Cingula, islandica, Friele.**

*Rissoa islandica*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 28, Pl. 11, fig. 8 & 9.

**Findested.** Station 48, 299 fv.

**Locality.** Station 48 (299 fathoms).

**Rissoa, Setia, griegi, Friele.***Rissoa griegi*, Friele, Jahrb. Deutsch. Mal. Gesellsch., vol. 6, 1879, p. 274.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 28, Pl. 11, fig. 10.

**Findested.** Station 353, 1333 fv.

I det paa station 353 fundne træstykke, der var gennemhullet af en *teredo*, har vi senere i teredogangene fundet endnu to fuldt udviklede eksemplarer af denne art. Vi kan derfor supplere den tidligere beskrivelse. Skallet er temmelig solid og rustbrun. Sidste vinding er stærkt opsvulmet og indtager omtrent to trediedele af skallets længde. Skulpturen bestaar af en mere eller mindre kraftig striering, som er adskillig kraftigere, end hvad tegningen viser. Størrelsen: axiallængde 1.7 mm., diameter 1.3 mm. Frieles formodning, at den oprindelig beskrevne *rissoa griegi* var et ikke fuldt udviklet eksemplar, har saaledes vist sig at være rigtig.

**Locality.** Station 353 (1333 fathoms).

In the piece of wood, found at Station 353, that had been bored by a *Teredo*, we subsequently found in the *Teredo*-tubes two fully-developed specimens of this species. We can therefore supplement the former description. The shell is fairly solid, and of a rusty brown colour. The last whorl is greatly swollen, and occupies about  $\frac{2}{3}$  of the length of the valve. The sculpturing consists of a more or less marked spiral striation, which is more strongly than the drawing shows. Size — axial length 1.7 mm., diameter 1.3 mm. Friele's supposition that the *R. griegi* originally described was a specimen that was not fully developed, has thus proved to be correct.

**Skenea planorbis, Fabricius.***Turbo planorbis*, Fabricius, Fau. Grøn., 1780, p. 394.*Skenea* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 65, Pl. 1, fig. 4, Pl. 70, fig. 1.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 184.

**Findested.** Vardø.

*Skenea planorbis* er udbredt fra Spitsbergen til Middelhavet og Madeira og fra Grønland til Florida. Fossil er den kjendt fra Skandinavien, nordlige Rusland og Skotland.

**Locality.** Vardø.

*S. planorbis* is distributed from Spitsbergen to the Mediterranean and Madeira, and from Greenland to Florida. It is a fossil in Scandinavia, northern Russia, and Scotland.

**Jeffreysia globularis, Jeffreys.***Jeffreysia globularis*, Jeffreys, m. s., Forbes & Hanley, Brit. Moll., vol. 4, 1853, p. 268, Pl. 133, fig. 5.

— — Jeffreys, Brit. Conch., vol. 4, 1867, p. 62, Pl. 69, fig. 7.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 347, Pl. 33, fig. 8.

**Findested.** Husø, 3—4 fv. og Tromsø, 5—10 fv.

Udenfor Norge er denne art blot kjendt fra Shetlandsøerne og Skotlands vestkyst.

**Locality.** Husø (3—4 fathoms) and Tromsø (5—10 fathoms).

The Shetland Isles and the west coast of Scotland are the only places out of Norway where this species is known.

**Cerithium procerum, Jeffreys.***Cerithium procerum*, Jeffreys, Ann. Mag. Nat. Hist., ser. 4, vol. 19, 1877, p. 322.— *danielsseni*, Friele, Nyt Mag. for Naturvidensk., vol. 23, 1877, p. 3.— *procerum*, Jeffreys, Proc. Zool. Soc., 1885, p. 53, Pl. 6, fig. 2.**Findested.** Stationerne 18, 51, 54, 87, 124, 164, 192, 251 og 312. Dybde 350—1163.**Locality.** Stations 18, 51, 54, 87, 124, 164, 192, 251, and 312. Depth 350—1163 fathoms.



Foruden af Nordhavsexpeditionen er denne art taget af Valorous, Triton og Porcupineexpeditionerne i det nordlige af Atlanterhavet. Den bathymetriske udbredelse er 350—1450 fv.

This species, besides being found by the Norwegian North Atlantic Expedition, has been found by the 'Valorous', the 'Triton', and the 'Porcupine' Expeditions in the North Atlantic. Its bathymetrical distribution is from 350 to 1450 fathoms.

#### **Lovenella metula**, Lovén.

*Cerithium metula*, Lovén, Ind. Moll. Scand., 1846, p. 23.

— — — — — Jeffreys, Brit. Conch., vol. 4, 1867, p. 256, vol. 5, p. 217, Pl. 70, fig. 3.

*Lovenella* — — — — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 187, Pl. 13, fig. 5, Pl. VII, fig. 4, Pl. XVIII, fig. 27.

**Findested.** Stationerne 1, 10, 173 b, 192, 195, 255, 261, 275, 290, 323, 326, 359, Husø, 40—60 fv., Rognan Salten, 20 fv. og Hammerfest, 30 fv. Dybde 20—650 fv.

*Lovenella metula* er udbredt fra Spitsbergen til Middelhavet. Den bathymetriske udbredelse er 20—994 fv.

**Locality.** Stations 1, 10, 173 b, 192, 195, 255, 261, 275, 290, 323, 326, and 359, Husø (40—60 fathoms), Rognan Salten (20 fathoms), and Hammerfest (30 fathoms). Depth 20—650 fathoms.

*Lovenella metula* is distributed from Spitsbergen to the Mediterranean. Its bathymetrical distribution is from 20 to 994 fathoms.

#### **Cerithiopsis costulata**, Møller.

*Turitella costulata*, Møller, Ind. Moll. Grøn., 1842, p. 10.

*Cerithiopsis* — — — — — Jeffreys, Brit. Conch. vol. 4, 1867, p. 272, vol. 5, p. 217, Pl. 71, fig. 5.

— — — — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 189, Pl. 13, fig. 7, Pl. VII, fig. 5, Pl. XVIII, fig. 28.

**Findested.** Stationerne 124, 173 b, 192, 195, 237, 255, 290, 329, 359 og Husø, 40—60 fv. Dybde 40—649 fv.

Ved den norske kyst forekommer denne art sparsomt op til Hammerfest. Forøvrigt er den kjendt fra Murmankysten, Bohuslän, Vesteuropa, Middelhavet, Jan Mayen, Island, Grønland og Nordamerikas østkyst. Den bathymetriske udbredelse er 40—1622 fv. Fossil er den fundet ved Uddevalla og paa de Britiske øer.

**Locality.** Stations 124, 173 b, 192, 195, 237, 255, 290, 320, and 359, and Husø (40—60 fathoms). Depth 40—649 fathoms.

This species occurs sparsely on the Norwegian coast up to Hammerfest. It is further known from the Murman Coast, Bohuslän, Western Europe, the Mediterranean, Jan Mayen, Iceland, Greenland, and the east coast of N. America. Its bathymetrical distribution is from 40 to 1622 fathoms. It is a fossil in Uddevalla and in the British Isles.

#### **Læocochlis granosa**, S. Wood.

*Cerithium granosum*, S. Wood, Crag. Moll., vol. 1, 1848, p. 73, Pl. 8, fig. 9.

*Læocochlis granosa*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 190, Pl. 13, fig. 6.

**Findested.** Stationerne 195, 255, 290 og 323. Dybde 107—341 fv.

Ved den norske kyst forekommer *læocochlis granosa* fra Jæderen til Vardø. Desuden er den kjendt fra Murmankysten, Færokanalen og Irlands vestkyst. Den bathymetriske udbredelse er 30—630 fv. Fossil er den kjendt fra England og Belgien.

**Locality.** Stations 195, 255, 290, and 323. Depth 107—341 fathoms.

*L. granosa* occurs off the Norwegian coast from Jæderen to Vardø. It is also found on the Murman Coast, in the Faroe Channel, and on the west coast of Ireland. Its bathymetrical distribution is from 30 to 630 fathoms. It is a fossil in England and Belgium.

**Aporrhais serresianus**, Michaud.

*Rostellaria serresiana*, Michaud, Bul. Soc. Linn. Bordeaux, 1828, p. 120, fig. 3 & 4.

*Aporrhais mucandrea*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 253, vol. 5, p. 216, Pl. 80, fig. 2

— *serresianus*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 192, Pl. 22, fig. 7.

**Findested.** Station 79, 155 fv.

Den er udbredt langs vor vestkyst til Lofoten. Mod syd gaar den til Middelhavet og Adriaterhavet. Desuden har Valorousexpeditionen faaet den i Davisstrædet. Den bathymetriske udbredelse er 40—1230 fv. Fossil er den funden i Belgien og Italien.

**Locality.** Station 79. Depth 155 fathoms.

It is distributed along the west coast of Norway up to Lofoten. It extends southwards to the Mediterranean and the Adriatic; and the Valorous Expedition found it in Davis Strait. Its bathymetrical distribution is from 40 to 1230 fathoms. It is a fossil in Belgium and Italy.

**Scalaria grønlandica**, Chemnitz.

*Turbo clathrus grønlandicus*, Chemnitz, Conch. Cab., vol. 11, 1795, p. 155, Pl. 195, fig. 1878—79.

*Scalaria grønlandica*, Møller, Ind. Moll. Gronl., 1842, p. 10.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 194, Pl. 10, fig. 15, Pl. 23, fig. 1, Pl. VII, fig. 11.

**Findested.** *Forma typica*, stationerne 260 og 261, 127 fv, station 322, 21. Var. *crebricostata*, station 323, 223 fv., var. *ornata*, station 124, 350 fv.

Varieteten *ornata* udmærker sig ved sine talrige længderibber; den har mere end dobbelt saa mange som *crebricostata*. Medens denne har ca. 15 ribber, talte vi hos *ornata* 34 paa sidste vinding. Længde 38 mm.

*Scalaria grønlandica* er en circumpolar art som er kjendt fra Grønland, Nordamerikas øst- og vestkyst, Island, Færokanalen, Murmankysten, Spitsbergen, Barentshavet, Sibiriens ishavskyster og Beringstrædet. Den er udbredt langs hele den norske kyst, ved sydkysten optræder den dog blot i smaa, forkroblede exemplarer. Den bathymetriske udbredelse er 10—350 fv. Fossil er den funden ved Uddevalla, nordlige Rusland, England og Nordamerika.

**Locality.** The type form at Stations 260 & 261 (127 fathoms), and 322 (21 fathoms); var. *crebricostata* at Station 323 (223 fathoms) var. *ornata* at Station 124 (350 fathoms).

The variety *ornata* is distinguished by its numerous longitudinal ribs. It has more than twice as many as *crebricostata*; for while the latter has about 15 ribs, we counted 34 in *ornata*, on the last whorl. Length 38 mm.

*Scalaria grønlandica* is a circumpolar species, known from Greenland, the east and west coasts of N. America, Iceland, the Faroe Channel, the Murman Coast, Spitsbergen, the Barents Sea, the Arctic shores of Siberia, and in Bering Strait. It is distributed all along the Norwegian coast, the specimens found on the south coast being, however, small and stunted. Its bathymetrical distribution is from 10 to 350 fathoms. It is a fossil at Udevalla, in northern Russia, England and N. America.

**Aclis walleri**, Jeffreys.

*Aclis walleri*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 105, vol. 5, p. 210, Pl. 72, fig. 4.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 196, Pl. 22, fig. 8.

**Findested.** Stationerne 173 b, 195 og 255. Dybde 107—341 fv.

*Aclis walleri* forekommer langs vor vestkyst op til Vesteraalen. Mod syd gaar den til Middelhavet og de Kapverdiske oer. Endvidere er den tagen ved Labrador og New England. Den bathymetriske udbredelse er 40—1360 fv. Fossil er den funden i England og Italien.

**Locality.** Stations 173 b, 195, and 255. Depth 107—341 fathoms.

*A. walleri* occurs along the west coast of Norway up to Vesteraalen. It extends southwards to the Mediterranean and the Cape Verd Islands, and has also been taken in Labrador and New England. Its bathymetrical distribution is from 40 to 1360 fathoms. It is a fossil in England and Italy.

**Aclis exigua**, G. O. Sars.*Aclis exigua*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 196, Pl. 22, fig. 8.**Findested.** Station 173 b, 300 fv. og station 195, 107 fv.

Denne art har tidligere været kjendt fra vor vestkyst op til Lofoten, samt ved Shetlandsøerne og Davisstrædet.

**Locality.** Stations 173 b (300 fathoms) and 195 (107 fathoms).

This species is known from the Norwegian west coast up to Lofoten, the Shetland Isles, and Davisstrædet.

**Hemiaclis ventrosa**, (Jeffreys, m. s.), Friele.*Aclis ventrosa*, Jeffreys, m. s., Friele, Christiania Vidensk. Selsk. Forhandl. 1875, p. 61, Pl. 1, fig. 7.*Hemiaclis* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 197, Pl. 11, fig. 16, Pl. VII, fig. 14, Pl. XVII, fig. 34.**Findested.** Stationerne 192, 290 og 297. Dybde 191—1280 fv.

Arten er kjendt fra Lofoten, Bergenskysten, Irlands vestkyst og Portugal. Den bathymetriske udbredelse er 50—1280 fv.

**Locality.** Stations 192, 290, and 297. Depth 191—1280 fathoms.

This species is known from Lofoten, the coast about Bergen, the west coast of Ireland, and Portugal. Its bathymetrical distribution is from 50 to 1280 fathoms.

**Hemiaclis glabra**, G. O. Sars.*Hemiaclis glabra*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 198, Pl. 11, fig. 14 & 15.**Findested.** Stationerne 173 b, 192 og 195. Dybde 107—649 fv.*Hemiaclis glabra* er tidligere funden ved Lofoten, Bodø og Bergenskysten, 80—150 fv.**Locality.** Stations 173 b, 192, and 195. Depth 107—649 fathoms.*H. glabra* has previously been found in Lofoten, Bodø, and on the coast about Bergen (80—150 fathoms).**Parthenia eximia**, Jeffreys.*Rissoa eximia*, Jeffreys, Ann. Mag. Nat. Hist., ser. 2, vol. 4, 1849, p. 299.*Odostomia* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 155, vol. 5, 213, Pl. 75, fig. 4.*Parthenia* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 199, Pl. 11, fig. 3, Pl. 22, fig. 13.**Findested.** Hammerfest, 20 fv.*Parthenia eximia* er udbredt langs hele vor kyst. Desuden er den funden i Færøkanalen, Shetlandsøerne, Skotland og Irlands vestkyst. Melvill og Standen anfører den fra Frants Josefs land. Den bathymetriske udbredelse er 10—420 fv. Fossil er den funden i vore yngre glaciæle skjælbanker.**Locality.** Hammerfest (20 fathoms).*P. eximia* is distributed all along the Norwegian coast, and is further found in the Faroe Channel, off the Shetland Isles, Scotland, and the west coast of Ireland. Melvill and Standen mention its occurrence in Franz Josef Land. Its bathymetrical distribution is from 10 to 420 fathoms. It is a fossil in the later glacial shell-banks of Norway.



**Parthenia spiralis**, Montagu.

*Turbo spiralis*, Montagu, Test. Brit., vol. 2, 1803, p. 323, Pl. 12, fig. 9.

*Odostomia* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 154, Pl. 2, fig. 5, vol. 5, p. 213, Pl. 75, fig. 3.

*Parthenia* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 200, Pl. 11, fig. 4.

**Findested.** Station 195, 107 fv. og Bodø, 40 fv.

*Parthenia spiralis* forekommer sparsomt langs den norske kyst til Vestfinmarken. Mod syd gaar den til Middelhavet og Adriaterhavet. Den bathymetriske udbredelse er 8—690 fv. Fossil er den funden i Norge, Skotland og Italien.

**Locality.** Station 195 (107 fathoms) and Bodø (40 fathoms).

*P. spiralis* occurs sparsely all along the Norwegian coast as far as west Finmark. It extends southwards to the Mediterranean and the Adriatic. Its bathymetrical distribution is from 8 to 690 fathoms. It is a fossil in Norway, Scotland, and Italy.

**Odostomia unidentata**, Montagu.

*Turbo unidentatus*, Montagu, Test. Brit., vol. 2, 1803, p. 324.

*Odostomia unidentata*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 134, vol. 5, p. 211, Pl. 74, fig. 1.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 201, Pl. 11, fig. 6—8.

**Findested.** Bodø, 40 fv., station 173 b, 300 fv. og station 195, 107 fv.

*Odostomia unidentata* er udbredt fra Finmarken og Island til Middelhavet, Madeira og Kanariske øer samt fra Cape Hatteras til Pernambuco. Den bathymetriske udbredelse er 0—808 fv. Fossil er den funden i Norge, Britiske øer og Calabrien.

**Locality.** Bodø (40 fathoms), and Stations 173 b (300 fathoms) and 195 (107 fathoms).

*O. unidentata* is distributed from Finmark and Iceland, to the Mediterranean, Madeira and the Canary Isles, and from Cape Hatteras to Pernambuco. Its bathymetrical distribution is from 0 to 808 fathoms. It is a fossil in Norway, the British Isles, and Calabria.

**Odostomia acuta**, Jeffreys.

*Odostomia acuta*, Jeffreys, Ann. Mag. Nat. Hist., ser. 2, vol. 2, 1848, p. 338.

— — Jeffreys, Brit. Conch., vol. 4, 1867, p. 130, vol. 5, p. 211, Pl. 73, fig. 8.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 202, Pl. 22, fig. 11.

**Findested.** Station 173 b, 300 fv. og station 195, 107 fv.

Arten er udbredt fra Nordkap til Middelhavet og de Canariske øer. Den bathymetriske udbredelse er 0—300 fv. Fossil er den funden paa de britiske øer og Sicilien.

**Locality.** Stations 173 b (300 fathoms) and 195 (107 fathoms).

*O. acuta* is distributed from the North Cape to the Mediterranean and the Canary Isles. Its bathymetrical range is from 0 to 300 fathoms. It is a fossil in the British Isles and in Sicily.

**Odostomia pallida**, Montagu.

*Turbo pallidus*, Montagu, Test. Brit., vol. 2, 1803, p. 325, Pl. 21, fig. 4.

*Odostomia pallida*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 124, vol. 5, p. 211, Pl. 73, fig. 5.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 203, Pl. 22, fig. 12.

Kun et exemplar af denne art toges i Hjertøsund ved Bodø, 40 fv., hvor den ogsaa tidligere er taget af Sars. Arten er forøvrigt kjendt fra Bergenskysten, Bohuslen,

Only one specimen of this species was taken, in Hjertøsund near Bodø (40 fathoms), where it is previously found by Sars. The species is further known to

Britiske øer og Middelhavet. Den bathymetriske udbredelse er 2—250 fv. Fossil er den funden paa de Britiske øer og Italien.

occur off the coast about Bergen, Bohuslän, the British Isles, and the Mediterranean. Its bathymetrical distribution is from 2 to 250 fathoms. It is a fossil in the British Isles and in Italy.

### ***Odostomia sublustris*, Friele.**

*Odostomia sublustris*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 29, Pl. 11, fig. 11.

**Findested.** Stationerne 124, 192 og 251. Dybde 350—649 fv.

**Locality.** Stations 124, 192, and 251. Depth 350—649 fathoms.

### ***Odostomia normani*, Friele.**

*Odostomia normani*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 29, Pl. 11, fig. 12.

*Odostomia normani* foreligger kun fra Sognefjordens munding. Endvidere er den kjendt fra Florø og Bergen. Den bathymetriske udbredelse er 30—50 fv.

The only specimens of *O. normani* are from the mouth of the Sogne Fjord. It also occurs at Florø and Bergen. Its bathymetrical distribution is from 30 to 50 fathoms.

### ***Auriculina insculpta*, Montagu.**

*Turbo insculptus*, Montagu, Test. Brit., Suppl., 1808, p. 129,

*Odostomia insculpta*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 139, vol. 5, p. 211, Pl. 74, fig. 4.

*Auriculina* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 204, Pl. 11, fig. 11 & 12.

**Findested.** Hammerfest, 20 fv.

*Auriculina insculpta* er udbredt fra Vestfinmarken og Island til Gibraltar. Den bathymetriske udbredelse er 10—586 fv. Fossil er den funden i Norge, England og Sicilien.

**Locality.** Hammerfest (20 fathoms).

*A. insculpta* is distributed from West Finmark and Iceland to Gibraltar. Its bathymetrical distribution is from 10 to 586 fathoms. It is a fossil in Norway, England, and Sicily.

### ***Auriculina coarctata*, G. O. Sars.**

*Auriculina coarctata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 205, Pl. 11, fig. 11.

**Findested.** Hammerfest, 50—60 fv.

Den eneste lokalitet, hvorfra denne art tidligere foreligger, er Hasvig, Vestfinmarken, 50—100 fv.

**Locality.** Hammerfest (50—60 fathoms).

The only locality in which this species has previously been found is Hasvig in West Finmark (50—100 fathoms).

**Eulimella scillæ**, Scacchi.

*Melania scillæ*, Scacchi, Not. Int. Conch., 1835, p. 51.

*Odostomia* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 169, vol. 5, p. 213, Pl. 76, fig. 5.

*Eulimella* — G. O. Sars, Moll. Reg. Norv., 1878.

**Findested.** Sognefjord, 100 fv., station 195, 107 fv. og station 255, 341 fv.

*Eulimella scillæ* er udbredt fra Vesteraalen til Middelhavet, Madeira, Canariske øer og Kapverdiske øer. Ved Amerikas østkyst er den funden ved Antillerne, Florida og Nord Carolina. Den bathymetriske udbredelse er 12—1192 fv. Fossil er den funden over en større del af Europa.

**Locality.** Sogne Fjord (100 fathoms), and Stations 195 (107 fathoms) and 255 (341 fathoms).

*E. scillæ* is distributed from Vesteraalen to the Mediterranean, Madeira, the Canary and the Cape Verd Islands. On the east coast of America it is found in the Antilles, Florida, and N. Carolina. Its bathymetrical distribution is from 12 to 1192 fathoms. It is a fossil in many parts of Europe.

**Eulimella compactilis**, Jeffreys.

*Odostomia scillæ*, var. *compactilis*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 169.

*Eulimella compactilis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 208, Pl. 22, fig. 15.

**Findested.** Station 149, 135 fv.

Denne art forekommer langs vor vestkyst til Lofoten. Endvidere er den kendt fra Shetlandsøerne, Hebriderne og Irland. Den bathymetriske udbredelse er 50—690 fv.

**Locality.** Station 149 (135 fathoms).

This species occurs all along the west coast of Norway up to Lofoten, and is also found in the Shetland Isles, the Hebrides, and Ireland. Its bathymetrical distribution is from 50 to 690 fathoms.

**Eulimella ventricosa** Forbes.

*Parthenia ventricosa*, Forbes, Rep. Brit. Ass. 1843, p. 188.

*Odostomia acicula*, var. *ventricosa*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 171, vol. 5, p. 213, Pl. 76, fig. 7.

*Eulimella ventricosa*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 209, Pl. 11, fig. 19, Pl. 22, fig. 16.

**Findested.** Station 195, 107 fv. og station 255, 341 fv.

Ligesom foregaaende art har *eulimella ventricosa* sin nordgrænse ved Lofoten og Vesteraalen. Mod syd gaar den til Middelhavet og de Capverdiske øer. Den bathymetriske udbredelse er 10—1095 fv. Fossil er den funden i Italien.

**Locality.** Stations 195 (107 fathoms) and 255 (341 fathoms).

*E. ventricosa*, like the preceding species, has its northern limit at Lofoten and Vesteraalen. It extends southwards to the Mediterranean and the Cape Verd Islands. Its bathymetrical distribution is from 10 to 1095 fathoms. It is found as a fossil in Italy.

**Eulima frielei**, Jordan.

*Eulima frielei*, Jordan, Proc. Mal. Soc., vol. 1, 1895, p. 266, Pl. 16, fig. 6.

**Findested.** Husø, 40—60 fv.

*Eulima frielei* staar nær *eulima intermedia*, fra hvilken den dog adskiller sig ved sin smekrere form, tyndere tekstur og længere mund. Den mangler desuden de fine mikroskopiske spiralstriber, som findes hos den typiske *eulima intermedia*. Ved Bergenskysten er denne form ikke sjelden. Jordan har arten fra Tritonexpeditionen i Færokanalen.

**Locality.** Husø (40—60 fathoms).

*Eulima frielei* is nearly allied to *E. intermedia*, from which it is distinguished, however, by its more slender form, its thinner texture, and its longer mouth. It is also without the fine, microscopic, spiral striæ found in the typical *E. intermedia*. This form is not uncommon off the coast about Bergen. Jordan obtained the species through the Triton Expedition in the Faroe Channel.



**Eulima incurva**, Renieri.

*Helix incurva*. Renieri, Tav. Alfab. Adriat., 1804, p. 4.

*Eulima distorta*. Jeffreys, Brit. Conch., vol. 4, 1867, p. 205, vol. 5, p. 214, Pl. 77, fig. 5.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 210, Pl. 11, fig. 23.

**Findested.** Station 173 b, 300 fv. og station 192, 649 fv.

Inden Atlanterhavsomraadet er *eulima incurva* udbredt fra Vester-aalen og Lofoten til Middelhavet, Adriaterhavet, Nordafrikas vestkyst, Azorerne, Madeira og Canari-ske øer og fra New England til Vestindien. Desuden er den funden ved Japan og Mazatlan, Mexico. Den bathy-metriske udbredelse er 0—1261 fv. Fossil er den funden i Norge, Britiske øer, Italien o. s. v.

**Locality.** Stations 173 b (300 fathoms) and 192 (649 fathoms).

In the Atlantic. *E. incurva* is distributed from Vester-aalen and Lofoten to the Mediterranean, the Adriatic, the north-west coast of Africa, the Azores, Madeira, and the Canary Isles; and from New England to the West Indies. Other places of occurrence are Japan and Mazatlan, Mexico. Bathymetrical distribution 0—1261 fathoms. Fossil in Norway, the British Isles, Italy, etc.

**Eulima bilineata**, Alder.

*Eulima bilineata*, Alder, Trans. Tyn. Nat. Field Club, 1848, p. 47.

— — Jeffreys, Brit. Conch., vol. 4, 1867, p. 210, vol. 5, p. 215, Pl. 77, fig. 8.

G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 210, Pl. 11, fig. 22.

**Findested.** Stationerne 10, 79, 173 b, 192, 195, 255 og Husø, 40—60 fv. Dybde 40—649 fv.

*Eulima bilineata* er udbredt fra Hammerfest til Mid-delhavet og Nordafrikas vestkyst. Endvidere er den funden ved Jamaica, St. Domingo, Florida og Nord Carolina. Den bathymetriske udbredelse er 5—690 fv. Fossil er den funden i Norge, Britiske øer og Italien.

**Locality.** Stations 10, 79, 173 b, 192, 195 and 255, and Husø (40—60 fathoms). Depth 40—649 fathoms.

*E. bilineata* is distributed from Hammerfest to the Mediterranean and the north-west coast of Africa. Other places of occurrence are Jamaica, St. Domingo, Florida, and N. Carolina. Bathymetrical distribution 5—690 fathoms. Fossil in Norway, the British Isles and Italy.

**Eulima stenostoma**, Jeffreys.

*Eulima stenostoma*, Jeffreys, Ann. Mag. Nat. Hist., ser. 3, vol. 2, 1858, p. 128, Pl. 5, fig. 7.

— Jeffreys, Brit. Conch., vol. 4, 1867, p. 207, vol. 5, p. 215, Pl. 77, fig. 6.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 211, Pl. 11, fig. 21.

**Findested.** Stationerne 1, 253, 255, 257, 260 og 261. Dybde 127—650 fv.

*Eulima stenostoma* er udbredt fra Lofoten til Middelhavet. Endvidere er den tagen af 'Valorous' expeditionen mellem Island og Grønland. Ligeledes er den funden i St. Lawrencebugten. Den bathymetriske udbredelse er 40—1062 fv.

**Locality.** Stations 1, 253, 255, 257, 260, and 261. Depth 127—650 fathoms.

*E. stenostoma* is distributed from Lofoten to the Mediterranean. It was also found by the 'Valorous' between Iceland and Greenland; and it has been found in the Gulf of St. Lawrence. Bathymetrical distribution 40—1062 fathoms.

**Eulima lauræ**, Friele.

*Eulima lauræ*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 30, Pl. 11, fig. 13 & 14.

Denne art foreligger kun i tre eksemplarer fra station 192, 649 fv.

There are only three specimens of this species, from Station 192 (649 fathoms).

**Adeorbis fragilis**, G. O. Sars.

*Adeorbis fragilis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 213, Pl. 22, fig. 19.

*Adeorbis fragilis* foreligger i nogle faa exemplarer fra station 192, 649 fv. og station 195, 107 fv. Arten er forøvrigt kjendt fra Lofoten og Spanien og Portugals sydvestkyst. Den bathymetriske udbredelse er 60—994 fv.

I sin monografi over cragmolluskerne (vol. 1, p. 149, Pl. 15, fig. 11) beskriver S. Wood en *sigaretus excavatus*, som minder meget om denne art, den har dog en lavere spire. Hvorvidt disse er identiske tør vi dog ikke udtale os om, da vi ikke har havt anledning til at austille en noiere sammenligning.

*A. fragilis* is represented by a few specimens from Stations 192 (649 fathoms) and 195 (107 fathoms). Other places of occurrence are Lofoten, and the south-west coast of Spain and Portugal. Bathymetrical distribution 60—994 fathoms.

S. Wood, in his monograph on the Mollusca of the crag (vol. I, p. 149, Pl. XV, fig. 11) describes a *Sigaretus excavatus*, which very much resembles this species, although it has a lower spire. We will not venture to express an opinion as to whether the two are identical, as we have unfortunately had no opportunity of making a direct comparison.

**Admete viridula**, Fabricius.

*Tritonium viridulum*, Fabricius, Fau. Gronl., 1780, p. 402.

*Admete viridula*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 216, Pl. 13, fig. 1.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 24, Pl. 8, fig. 27—30.

**Findested.** Stationerne 10, 79, 192 (dødt exemplar) 224, 260, 267, 270, 273, 326, 338, 357. Hammerfest, 20 fv., Advent Bay, 20—40 fv. og Magdalena Bay, 30—60 fv. Dybde 20—220 (649) fv.

Denne i høi grad variable art er circumpolar. Den er kjendt fra Grønland, nordlige Amerika indtil Cape Cod, Nordeuropa indtil Kanalen, Jan Mayen, Spitsbergen, Barentshavet, Novaja Semlja, Karahavet, St. Lawrence, Beringshavet og det nordlige Japan. Den bathymetriske udbredelse er 2—1255 fv. Fossil er den funden i Norge, Britiske øer, Belgien, Island, Spitsbergen, nordlige Rusland, Sibirien og Labrador.

**Locality.** Stations 10, 79, 192 (dead specimen), 224, 260, 267, 270, 273, 326, 338 and 357, Hammerfest (20 fathoms), Advent Bay (20—40 fathoms) and Magdalena Bay (30—60 fathoms). Depth 20—220 (649) fathoms.

This exceedingly variable species is circumpolar. Distribution — Greenland, N. America down to Cape Cod, N. Europe down to the English Channel, Jan Mayen, Spitsbergen, Barents Sea, Novaja Semlja, Kara Sea, Gulf of St. Lawrence, Bering Sea, and north of Japan. Bathymetrical distribution 2—1255 fathoms. Fossil in Norway, the British Isles, Belgium, Iceland, Spitsbergen, northern Russia, Siberia, and Labrador.

**Admete contabulata**, Friele.

*Admete contabulata*, Friele, Jahrb. Deutsch. Mal. Gesellsch., vol. 6, 1879, p. 276.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 24, Pl. 8, fig. 31 & 32.

**Findested.** Stationerne 124, 192 og 338. Dybde 146—649 fv.

**Locality.** Stations 124, 192 and 338. Depth 146—649 fathoms.

**Admete inflata**, Friele.

*Trichotropis inflata*, Friele, Jahrb. Deutsch. Mal. Gesellsch., vol. 6, 1879, p. 275.

*Admete* — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 25, Pl. 8, fig. 33.

**Findested.** Stationerne 192, 312 og 323. Dybde 223—658 fv. Verrill anfører den desuden fra kysten af New England, 1290 fv.

**Locality.** Stations 192, 312 and 323. Depth 223—658 fathoms. Verrill also mentions its occurrence off the coast of New England (1290 fathoms).

**Clathurella linearis**, Montagu.

*Murex linearis*, Montagu, Test. Brit., 1803, p. 261, Pl. 9, fig. 4.

*Defrancia* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 368, Pl. 89, fig. 2.

*Clathurella* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 218, Pl. 23, fig. 2.

**Findested.** Husø, 40—60 fv., Hopen, Namdalen, 10—15 fv. og station 173 b, 300 fv. (dødt exemplar).

**Locality.** Husø (40—60 fathoms), Hopen, Namdal (10—15 fathoms), and Station 173 b (300 fathoms; dead specimen).

*Clathurella linearis* gaar mod nord til Hammerfest og Island. Mod syd er den udbredt til Middelhavet, Madeira og Canariske øer. Den bathymetriske udbredelse er 8—180 fv. Fossil er den funden i Norge, Britiske øer og Italien.

*C. linearis* extends northwards to Hammerfest and Iceland; southwards to the Mediterranean, Madeira, and the Canary Isles. Bathymetrical distribution 8—180 fathoms. Fossil in Norway, the British Isles, and Italy.

**Taranis cirrata**, Brugnone.

*Pleurotoma cirratum*, Brugnone, Pleur. fost. Palermo, 1862, p. 17, fig. 9.

*Trophon mörchii*, Malm, Göteborgs Vet. Sam. Handl., vol. 3, 1863, Pl. 2, fig. 5.

*Taranis* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 220, Pl. 17, fig. 8.

**Findested.** Stationerne 1, 2, 255, 261, Husø, 100 fv. og Rognan, Salten, 20 fv. Dybde 20—672 fv.

**Locality.** Stations 1, 2, 255 and 261, Husø (100 fathoms) and Rognan, Salten (20 fathoms). Depth 20—672 fathoms.

*Taranis cirrata* er udbredt langs hele den norske kyst. Endvidere er den kjendt fra Bohuslen, Biskayerbugten, vest af den spanske halvø og Maroco, Middelhavet og Amerikas østkyst, hvor den er udbredt fra Newport til Mexicanske golf og Vestindien. Den bathymetriske udbredelse er 20—1255 fv. Fossil er den funden i Calabrien og Sicilien.

*T. cirrata* is distributed all along the Norwegian coast. Other places of occurrence are Bohuslän, Bay of Biscay, west off the Spanish peninsula and Marocco, Mediterranean, and east coast of N. America, where it extends from Newport to the Gulf of Mexico and the West Indies. Bathymetrical distribution 20—1255 fathoms. Fossil in Calabria and Sicily.

**Mangilia, Teretia, anceps**, Eichwald.

*Pleurotoma anceps*, Eichwald, Nat. von Lith. und Volh., 1830, p. 225.

*Defrancia teres*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 362, Pl. 88, fig. 5.

*Raphitoma anceps*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 219, Pl. 17, fig. 9.

**Findested.** Station 173 b, 300 fv. og 192, 649 fv. samt Hopen, Namdalen.

**Locality.** Stations 173 b (300 fathoms) and 192 (649 fathoms), and Hopen, Namdal.



*Mangilia anceps* forekommer meget sparsom langs den norske kyst op til Vestfinmarken. Mod syd gaar den til Marocos vestkyst, Canariske øer og Madeira. Den bathymetriske udbredelse er 14—1010 fv. Fossil er den funden i Østerige, Italien og det sydlige Frankrig.

*M. anceps* occurs very sparingly along the Norwegian coast up to west Finmark. It extends southwards to the west coast of Morocco, the Canary Isles, & Madeira. Bathymetrical distribution 14—1010 fathoms. Fossil in Austria, Italy, and the south of France.

#### **Mangilia, Teretia, amœna, G. O. Sars.**

*Raphitoma amœna*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 220, Pl. 17, fig. 10.

*Defrancia* — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 23, Pl. 10, fig. 22.

**Findested.** Stationerne 192, 195, 223, 260, 261, 270, 273, 290 og 357. Dybde 70—649 fv.

Denne vakre og eiendommelige art paavistes først af G. O. Sars ved Hasvig i Finmarken. Senere er den funden ved Tromsø, Murmankysten og Grønland. Den bathymetriske udbredelse er 30—649 fv.

**Locality.** Stations 192, 195, 223, 260, 261, 270, 273, 290 and 357. Depth 70—649 fathoms.

This pretty and peculiar species was discovered by G. O. Sars at Hasvig in Finmark. It has since been found at Tromsø, on the Murman Coast, and in Greenland. Bathymetrical distribution 30—649 fathoms.

#### **Mangilia, Thesbia, nana, Lovén.**

*Tritonium(?) nanum*, Lovén, Ind. Moh. Scand., 1846, p. 12.

*Columbella nana*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 359, Pl. 87, fig. 4.

*Thesbia* — G. O. Sars, Moll. Reg. Arct., 1878, p. 221, Pl. 16, fig. 2, Pl. VIII, fig. 3.

**Findested.** Stationerne 173 b, 192 og 290. Dybde 191—649 fv.

*Mangilia nana* er udbredt langs den norske kyst til Hammerfest. Forøvrigt er den kun kjendt fra Shetlandsøerne og Orknoerne. Den bathymetriske udbredelse er 30—649 fv.

**Locality.** Stations 173 b, 192 and 290. Depth 191—649 fathoms.

*M. nana* is distributed along the Norwegian coast up to Hammerfest, and is further known from the Shetland and Orkney Isles. Bathymetrical distribution 30—649 fathoms.

#### **Mangilia, Pleurotomella, packardi, Verrill.**

*Pleurotomella packardi*, Verrill, Am. Journ. Sci., vol. 5, 1872, p. 15.

— Verrill, Trans. Con. Acad., vol. 5, 1882, p. 453, Pl. 43, fig. 9, Pl. 57, fig. 5.

*Defrancia formosa*, Jeffreys, Proc. Zool. Soc., 1883, p. 397, Pl. 44, fig. 9.

**Findested.** Denne art foreligger i flere døde exemplarer fra station 192, 649 fv.

Den eneste lokalitet fra den norske kyst, hvorfra *mangilia packardi* tidligere har været kjendt, er havdybet udenfor Storeggen, 400 fv., hvor G. O. Sars tog et beskadiget exemplar. Arten er forøvrigt kjendt fra Færokanalen, Europas vestkyst fra kanalen til Gibraltar, Azorerne, Canariske øer og Amerikas østkyst fra New England til Vestindien. Den bathymetriske udbredelse er 85—1608 fv.

**Locality.** This species is represented by several dead specimens from Station 192 (649 fathoms).

The only locality on the Norwegian coast in which *M. packardi* has previously been found, is the deep water off Storeggen (400 fathoms), where G. O. Sars found a damaged specimen. Distribution — Faroe Channel, west coast of Europe from the English Channel to Gibraltar, Azores, Canary Isles, and east coast of America from New England to the West Indies. Bathymetrical distribution 85—1608 fathoms.

**Bela rugulata**, Troschel<sup>1)</sup>.

- Bela rugulata*, (Møller) Troschel, Gebis der Schnecken, vol. 2, 1866, p. 44, Pl. 4, fig. 6.  
 — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 230, Pl. 23, fig. 6, Pl. VIII, fig. 3.  
 — *assimilis*, G. O. Sars, op. cit., p. 231, Pl. 23, fig. 8, Pl. VIII, fig. 17.  
 — *gouldii*, Verrill, Trans. Con. Acad., vol. 5, 1882, p. 465, Pl. 57, fig. 6.  
 — *rugulata*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 3, Pl. 7, fig. 1—7, Pl. 9, fig. 1—12.

*Forma typica.*

**Findested.** Stationerne 224, 260, 267, 270, 273, Bodø, Tromsø og Hammerfest. Dybde 10—197 fv. Den forekommer forøvrigt langs hele den norske kyst og har i det hele en circumpolar udbredelse.

Var. *clathratus*, Friele.

**Findested.** Station 270, 136 fv.  
 Collin omtaler den fra Karahavet, 55 fv.

Var. *spitsbergensis*, Friele.

**Findested.** Magdalena Bay, 40—50 fv.  
 Krause har den fra Beringshavet. Både denne og den typiske form forekommer fossil på Spitsbergen og Murmankysten.

Var. *bergensis*, Friele.

**Findested.** Sognefjordens munding.  
 Denne form forekommer ligeledes ved Bergen, 100 fv., Molde og Trondhjemsfjorden 70—100 fv.

Var. *assimilis*, G. O. Sars.

**Findested.** Tromsø.  
 Formen går hos os mod syd til Lofoten. Endvidere er den kendt fra Murmankysten og Karahavet samt Grønland.

Var. *scalaroides*, G. O. Sars.

*Bela scalaroides*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 231, tab. 23, fig. 7, tab. VIII, fig. 15.  
**Findested.** Station 261, 127 fv. og station 290, 191 fv. G. O. Sars har den fra Hasvig, Vestfinmarken, 60—100 fv.

*Forma typica.*

**Locality.** Stations 224, 260, 267, 270, and 273, Bodø, Tromsø and Hammerfest. Depth 10—197 fathoms. It also occurs all along the Norwegian coast, and has, on the whole, a circumpolar distribution.

Var. *clathratus*, Friele.

**Locality.** Station 270 (136 fathoms).  
 Collin mentions it from the Kara Sea (55 fathoms).

Var. *spitsbergensis*, Friele

**Locality.** Magdalena Bay (40—50 fathoms).  
 Krause has it from the Bering Sea. Both this and the typical form occur as fossils in Spitsbergen and on the Murman Coast.

Var. *bergensis*, Friele.

**Locality.** The mouth of the Sogne Fjord.  
 This form also occurs at Bergen (100 fathoms), Molde, and in the Trondhjem Fjord (70—100 fathoms).

Var. *assimilis*, G. O. Sars.

**Locality.** Tromsø.  
 In Norway, this form extends southwards to Lofoten. Other places of occurrence are the Murman Coast, the Kara Sea, and Greenland.

Var. *scalaroides*, G. O. Sars.

*Bela scalaroides*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 231, Pl. 23, fig. 27, Pl. VIII, fig. 15.  
**Locality.** Stations 261 (127 fathoms) and 290 (191 fathoms). G. O. Sars found it at Hasvig in west Finmark (60—100 fathoms).

**Bela nobilis**, Møller.

- Defrancia nobilis*, Møller, Ind. Moll. Grøn., 1842, p. 12.  
*Bela* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 228, Pl. 16, fig. 19 & 20, Pl. VIII, fig. 14.  
 — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 5, Pl. 7, fig. 8, Pl. 9, fig. 13—15.

**Findested.** Tromsø og Hammerfest.

Hos os går den mod syd til Lofoten. Udenfor Norge er den kendt fra Grønland, Murmankysten, Hvidehavet, Novaja Semlja, Karahavet, Sibiriens ishavskyster og Beringshavet. Ifølge Knipowitsch forekommer den fossil på Spitsbergen.

**Locality.** Tromsø and Hammerfest.

In Norway, it extends southwards to Lofoten. Other places of occurrence — Greenland, Murman Coast, White Sea, Novaja Semlja, Kara Sea, Arctic shores of Siberia, and Bering Strait. According to Knipowitsch, it is a fossil in Spitsbergen.

<sup>1)</sup> På grund af den confusion der hersker med hensyn til *bela turricula*, Montagu, har vi ikke villet optage dette artsnavn.

<sup>1)</sup> Owing to the confusion that exists with regard to *B. turricula*, Montagu, we have not thought it desirable to adopt that specific name.

**Bela scalaris**, Møller.

*Defrancia scalaris*, Møller, Ind. Moll. Scand., 1842, p. 12.

*Bela* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 229, Pl. 16, fig. 6, Pl. VIII, fig. 16.

— — Verrill, Trans. Con. Acad., vol. 5, p. 471, Pl. 57, fig. 12.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 6, Pl. 7, fig. 9—14, Pl. 9, fig. 16—22.

*Forma typica.*

*Forma typica.*

**Findested.** Stationerne 18, 79, 260, 261, 290, 323 og 357. Dybde 123—223 fv.

**Locality.** Stations 18, 79, 260, 261, 290, 323 and 357. Depth 123—223 fathoms.

Var. *abyssicola*, Friele.

Var. *abyssicola*, Friele.

**Findested.** Stationerne 124, 192, 200, 251 og 312. Dybde 350—658 fv.

**Locality.** Stations 124, 192, 200, 251, and 312. Depth 350—658 fathoms.

Heller ikke denne art gaar hos os længere syd end til Lofoten. Den er endvidere tagen ved Grønland, Nord-amerikas østkyst indtil Cape Cod, Murmankysten, Novaja Semlja, Karahavet og Sibiriens ishavskyster. Knipowitsch angiver den som fossil fra Murmankysten.

This species also goes no farther south, in Norway, than Lofoten. Other places of occurrence — Greenland, east coast of N. America down to Cape Cod, Murman Coast, Novaja Semlja, Kara Sea, and Arctic shores of Siberia. Knipowitsch mentions it as a fossil on the Murman Coast.

**Bela exarata**, Møller.

*Defrancia exarata*, Møller, Ind. Moll. Grønland, 1842, p. 12.

*Tritonium mitrula*, Lovén, Ind. Moll. Scand., 1846, p. 145.

*Bela exarata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 232, Pl. 16, fig. 18, Pl. IX, fig. 1.

— *mitrula*, G. O. Sars, op. cit., p. 233, Pl. 23, fig. 9, Pl. IX, fig. 2.

— *concinnumula*, Verrill, Trans. Con. Acad., vol. 5, 1882, p. 468, Pl. 43, fig. 15, Pl. 57, fig. 11.

*exarata*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 19, Pl. 8, fig. 24.

At domme efter exemplarer, som Friele i sin tid modtog fra Verrill, er den amerikanske *bela exarata*, Verrill ikke identisk med den europæiske art. Derimod er *bela concinnumula*, Verrill og varieteten *acuta* synonym med vor art.

**Findested.** Tromsø, Hammerfest og Altenfjord, 10—30 fv.

Judging from specimens that Friele once received from Verrill, the American *Bela exarata*, Verrill, is not identical with the European species. *B. concinnumula*, Verrill, on the other hand, and the variety *acuta* are synonymous with our species.

**Locality.** Tromsø, Hammerfest and Alten Fjord (10—30 fathoms).

*Bela exarata* er kendt fra Grønland, Labrador, New England, Island, Irlands vestkyst, Murmankysten, Novaja Semlja, Karahavet og Sibiriens ishavskyster. Hos os er den typiske form ikke funden søndenfor Tromsø. Formen *mitrula*, Lovén, gaar derimod til Bohuslän. Den bathymetriske udbredelse er 10—1230 fv. Fossil er den kendt fra Grønland, Labrador, England og Spitsbergen.

Distribution — Greenland, Labrador, New England, Iceland, west coast of Ireland, Murman Coast, Novaja Semlja, Kara Sea, and Arctic shores of Siberia. In Norway, the typical form is not found south of Tromsø, while the form *mitrula*, Lovén, extends to Bohuslän. Bathymetrical distribution 10—1230 fathoms. Fossil in Greenland, Labrador, England & Spitsbergen.

**Bela obliqua**, G. O. Sars.

*Bela obliqua*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 226, Pl. 16, fig. 6, Pl. VIII, fig. 11.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 7, Pl. 7, fig. 15—17, Pl. 10, fig. 1 & 2.

**Findested.** Hammerfest, Tromsø og Salten, der er det sydligste findested for denne art ved vort kyst. Dybde 10—20 fv.

Udenfor Norge er arten kun kendt fra Grønland og Murmankysten. Den bathymetriske udbredelse er 10—100 fv.

**Locality.** Hammerfest, Tromsø and Salten, the last-named being the most southern locality for this species on the Norwegian coast

Besides from Norway, the species has been reported only from Greenland and the Murman Coast. Bathymetrical distribution 10—100 fathoms.



**Bela cancellata**, Mighels.

*Fusus cancellatus*, Mighels, Proc. Bost. Soc. Nat. Hist., vol. 1, 1840, p. 50.

*Defrancia elegans*, Møller, Ind. Moll. Grøn., 1842, p. 13.

*Tritonia declivis*, Lovén, Ind. Moll. Scand., 1846, p. 13.

*Bela elegans*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 225, Pl. 16, fig. 15, Pl. VIII, fig. 12.

— *declivis*, G. O. Sars, op. cit., p. 224, Pl. 16, fig. 10.

— *cancellata*, Verrill, Trans. Con. Acad., vol. 5, 1882, p. 475, Pl. 43, fig. 10 & 11.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 8, Pl. 7, fig. 18—22, Pl. 10, fig. 3—5.

*Forma typica.*

**Findested.** Stationerne 101, 200, 261, 262, 267, 290, 312, 359 og Tromsø, 10—12 fv. Dybde 10—658 fv.

*Forma declivis*, Lovén.

**Findested.** Stationerne 164, 192, 200, 323, Tromsø og Hammerfest. Dybde 20—649 f.

Den typiske form er hos os kun kendt fra Tromsø amt, varieteten *declivis* gaar helt syd til Molde. *Bela cancellata* er forøvrigt kendt fra Grønland, Nordamerikas østkyst, Island, Færøkanalen, Murmankysten og Novaja Semlja. Den bathymetriske udbredelse er 4—658 fv.

*Forma typica.*

**Locality.** Stations 101, 200, 261, 262, 267, 290, 312 and 359, and Tromsø (10—12 fathoms). Depth 10—658 fathoms.

*Forma declivis*, Lovén.

**Locality.** Station 164, 192, 200 and 323, Tromsø and Hammerfest. Depth 20—649 fathoms.

In Norway, the typical form is only known to occur in the Tromsø province, while the variety *declivis* extends as far south as Molde. Distribution — Greenland, east coast of N. America, Iceland, Faroe Channel, Murman Coast. and Novaja Semlja. Bathymetrical distribution 4—658 fathoms.

**Bela cinerea**, Møller.

*Defrancia cinerea*, Møller, Ind. Moll. Grøn., 1842, p. 13.

*Bela* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 227, Pl. 23, fig. 4.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 9, Pl. 7, fig. 23 a, Pl. 10, fig. 6.

**Findested.** Stationerne 262, 273, 337, 359 og 363. Dybde 146—416 fv.

Kun ved Tromsø og Finmarken er denne art tidligere tagen hos os. Forøvrigt forekommer den ved Grønland, Færøkanalen, Island, Murmankysten og Spitsbergen. Den bathymetriske udbredelse er 10—416 fv.

**Locality.** Stations 262, 273, 337, 359, and 363. Depth 146—416 fathoms.

In Norway, this species has previously been found only in Tromsø and Finmark. Other places of occurrence — Greenland, Faroe Channel, Iceland, Murman Coast, and Spitsbergen. Bathymetrical distribution 10—416 fathoms.

**Bela schmidtii**, Friele.

*Mungelia? plicifera*, Schmidt, Mem. Acad. de sci. St. Petersb., 1872, p. 57, Pl. 4, fig. 4 & 5.

*Pleurotoma* — Leche, Kgl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 58.

*Bela schmidtii*, Krause, Arch. for Naturgesch., vol. 51, 1885, p. 274, Pl. 18, fig. 1 & 7.

„ — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 10, Pl. 8, fig. 6.

Kun et voxent exemplar med en noget mutileret læbe blev funden i Magdalena Bay, 30 fv., og et ganske lidet i Advent Bay, 20 fv.

Den er funden levende i Karahavet, 7—180 fv. og Beringshavet og fossil ved nedre Jenisey.

Only one full-grown specimen, with a somewhat mutilated lip, was found in Magdalena Bay (30 fathoms), and one quite small one in Advent Bay (20 fathoms).

It is found living in the Kara Sea (7—180 fathoms) and the Bering Sea, and as a fossil by the lower Yenisei.

**Bela trevelyana**, Turton.

*Pleurotoma trevelliannum*, Turton, Ann. Mag. Nat. Hist., vol. 7, 1834, p. 351.

*Mangelia trevelliiana*, Forbes & Hanley, Brit. Moll., vol. 3, 1853, p. 452, Pl. 112, figs. 1 & 2.

*Pleurotoma trevelyana*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 398.

*Bela* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 235, Pl. 16, fig. 13, Pl. IX, fig. 4.

— — Friele, Nordhavs Exp. Moll. vol. 2, 1886, p. 11, Pl. 8, fig. 7—10, Pl. 10, fig. 10 & 11.

**Findested.** Stationerne 223, 224, 261, 267, 270, 273, 326, 357, Bodø, Tromsø og Hammerfest. Dybde 10—197 fv.

*Bela trevelyana* er udbredt langs hele vor kyst. Endvidere forekommer der ved Grønland, Nordamerikas østkyst, Island, Britiske øer, Danmark, Gascognerbugten, Murmankysten og Hvidehavet. Den bathymetriske udbredelse er 6—479. Fossil er den funden i Norge og Murmankysten.

**Locality.** Stations 223, 224, 261, 267, 270, 273, 326, and 357, Bodø, Tromsø, and Hammerfest. Depth 10—197 fathoms.

*B. trevelyana* is distributed all along the Norwegian coast. Other places of occurrence — Greenland, east coast of N. America, Iceland, British Isles, Denmark, Bay of Biscay, Murman Coast, and White Sea. Bathymetrical distribution 6—479 fathoms. Fossil in Norway and on the Murman Coast.

**Bela decussata**, Couthouy.

*Pleurotoma decussata*, Couthouy, Boston Journ. Nat. Hist., vol. 2, 1839, p. 183, Pl. 4, fig. 8.

*Defrancia viridula*, Møller, Ind. Moll. Grøn., 1842, p. 14.

*Bela conoidea*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 236, Pl. 16, fig. 14.

— *decussata*, Verrill, Trans. Con. Acad., vol. 5, 1882, p. 479, Pl. 43, fig. 13.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 12, Pl. 8, figs. 11—14, Pl. 10, fig. 12 & 13.

*Forma typica.*

**Findested.** Tromsø 20 fv. og station 267, 148 fv.

Var. *finmarchia*, Friele.

**Findested.** Tromsø, 20 fv.

Var. *conoidea*, G. O. Sars.

**Findested.** Station 323, 223 fv. og station 363, 260 fv.

Hos os er denne art kun kjendt fra Tromsø og Finmarken. Forøvrigt er den circumpolar, den er kjendt fra Grønland, Nordamerikas østkyst, Færøkanalen, Murmankysten, Novaja Semlja, Karahavet, Sibiriens ishavskyster, Awatska bugt. Den bathymetriske udbredelse er 4—560 fv. Fossil er den funden i Sibirien.

*Forma typica.*

**Locality.** Tromsø (20 fathoms) and Station 267 (148 fathoms).

Var. *finmarchia*, Friele.

**Locality.** Tromsø (20 fathoms).

Var. *conoidea*, G. O. Sars.

**Locality.** Stations 323 (223 fathoms), and 363 (260 fathoms).

In Norway, this species has only been found in Tromsø and Finmark. It is circumpolar, its distribution being Greenland, the east coast of N. America, the Faroe Channel, the Murman Coast, Novaja Semlja, the Kara Sea, the Arctic shores of Siberia, and Avacha Bay. Bathymetrical distribution 4—560 fathoms. Fossil in Siberia.

**Bela kobelti**, Verkrüzen.

*Bela kobelti*, Verkrüzen, Nachrichtsbl., 1876, no. 2, p. 17.

— Kobelt, Jahrb. Deutsch. Mal. Gesell., vol. 3, 1876, p. 178, Pl. 1, fig. 5.

— *viridula*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 235, Pl. 16, fig. 7 & 8, Pl. IX, fig. 5.

— *kobelti*, Friele, Nordhavns Exp. Moll., vol. 2, 1886, p. 13, Pl. 8, fig. 15.

**Findested.** Station 283, 767 fv., 2 døde exemplarer. Arten er forøvrigt kun kjendt fra Finmarken, 50—60 fv.

**Locality.** Stations 283 (767 fathoms; 2 dead specimens). The species is otherwise only known in Finmark (50—60 fathoms).

**Bela tenuicostata, M. Sars.**

*Pleurotoma tenuicostata*, M. Sars, Christiania Vidensk. Selsk. Forhandl., 1868, p. 259.

*Bela* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 237, Pl. 17, fig. 1, Pl. IX, fig. 6.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 14, Pl. 8, fig. 16 & 17, Pl. 10, fig. 14.

*Forma willei*, Friele, Op. cit., p. 14, Pl. 8, fig. 16 & 17.

**Findested.** Station 18, 40, 79, 87, 124, 137, 164, 192, 195, 200, 225, 251, 259, 273, 312, 323 og 362. Dybde 100—1215 fv. Varieteten *willei* forekommer sammen med hovedformen, paa de større dyb er dog varieteten den hyppigste.

*Bela tenuicostata* er udbredt langs vor vest- og nordkyst. Endvidere er den kjendt fra Grønland, Nordamerikas østkyst, nordlige Atlanterhav, Færøkanalen, Irlands vestkyst, Biskayebugten, Novaja Semlja og Sibiriens ishavskyster. Den bathymetriske udbredelse er 30—1622 fv. Fossil er den kjendt fra det nordlige Grønland.

**Locality.** Stations 18, 40, 79, 87, 124, 137, 164, 192, 195, 200, 225, 251, 259, 273, 312, 323, and 362. Depth 100—1215 fathoms. The variety *willei* occurs together with the principal form, the variety being the more frequent in greater depths.

*B. tenuicostata* is distributed along the west and north coasts of Norway. Other places of occurrence — Greenland, east coast of N. America, North Atlantic, Faroe Channel, west coast of Ireland, Bay of Biscay, Novaja Semlja, and Arctic shores of Siberia. Bathymetrical distribution 30—1622 fathoms. Fossil in the north of Greenland.

**Bela ovalis, Friele.**

*Pleurotoma (bela) ovalis*, Friele, Nyt. Mag. f. Naturvidensk., vol. 23, 1877, p. 9, fig. 5.

*Bela pygmaea*, Verrill, Trans. Con. Acad., vol. 5, 1882, p. 460, Pl. 57, fig. 8.

*Pleurotoma exigua*, Jeffreys, Proc. Zool. Soc., 1883, p. 399, Pl. 44, fig. 10.

*Bela ovalis*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 14, Pl. 8, fig. 21 & 22, Pl. 10, fig. 19.

**Findested.** Stationerne 35, 40, 240, 283, 295 og 353. Dybde 658—1333 fv.

Verrill har denne art fra New England, 312—1290 fv. „Triton“expeditionen fandt den i Færøkanalen, 570 fv. og „Caudan“expeditionen i Gascognerbugten, 919 fv.

**Locality.** Stations 35, 40, 240, 283, 295, 312, and 353. Depth 658—1333 fathoms.

Verrill has this species from New England (312—1290 fathoms), the ‘Triton’ found it in the Faroe Channel (570 fathoms), and the ‘Caudan’ in the Bay of Gascogne (919 fathoms).

**Bela bicarinata, Couthouy.**

*Pleurotoma bicarinata*, Couthouy, Boston Jour. Nat. Hist., vol. 2, 1839, p. 104, Pl. 1, fig. 11.

— *violacea*, Mighels, Proc. Boston Soc. Nat. Hist., vol. 1, 1841, p. 50.

*Defrancia cylindracea, livida & beckii*, Møller, Ind. Moll. Grøn., 1842, p. 13 & 14.

*Bela bicarinata & violacea*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 237 & 238, Pl. 16, fig. 11 & 12, Pl. 17, fig. 2 & 3, Pl. IX, fig. 7 & 8.

-- Verrill, Trans. Con. Acad., vol. 5, 1882, p. 482, Pl. 57, fig. 16.

— Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 15, Pl. 8, fig. 18 & 19, Pl. 10, fig. 15 & 16.

**Findested.** Stationerne 79, 124, 164, 173 b, 192, 200, 251, 260, 290, 312, 359 og Magdalena Bay. Dybde 30—658 fv.

Var. *geminolineata*, Friele.

**Findested.** Advent Bay, 5 fv.

Denne i høj grad varierende art er udbredt langs hele vor kyst. *Bela bicarinata* er forøvrigt circumpolar. Den bathymetriske udbredelse er 0—658 fv. Fossil forekommer den ifølge Knipowitsch paa Murmankysten og Spitsbergen.

**Locality.** Stations 79, 124, 164, 173 b, 192, 200, 251, 260, 290, 312, and 359, and Magdalena Bay. Depth 30—658 fathoms.

Var. *geminolineata*, Friele.

**Locality.** Advent Bay (5 fathoms).

This exceedingly variable species is distributed all along the Norwegian coast. Otherwise *B. bicarinata* is circumpolar. Bathymetrical distribution 0—658 fathoms. According to Knipowitsch, it occurs as a fossil on the Murman Coast and in Spitsbergen.



**Bela schantarica**, Middendorf.

*Pleurotoma schantaricum*, Middendorf, Beitr. Mall. Ross., vol. 2, 1849, p. 118.

— Middendorf, Sibir. Reise, vol. 2, part. 1, 1851, p. 223, Pl. 12, fig. 17—19.

*violacea*, var. *gigantea*, Leche, Kgl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 57, Pl. 1, fig. 16.

*Bela schantarica*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 17, Pl. 8, fig. 20, Pl. 10, fig. 17 & 18.

**Findested.** Magdalena Bay (30—50 fv.).

Udenfor Spitsbergen er denne art kjendt fra Frantz Josefs land, 1—3 fv., Novaja Semlja, 15 fv., Okotske hav og Upernivik, Grønland, 70 fv.

**Locality.** Magdalena Bay (30—50 fathoms).

Distribution — besides Spitsbergen — Franz Josef Land (1—3 fathoms), Novaja Semlja (15 fathoms), Sea of Okhotsk. and Upernavik, Greenland (70 fathoms).

**Bela impressa**, Beck.

*Pleurotoma, ischnula, impressa*, Beck, Mørch, Cat. Moll. Spitzberg, 1869, p. 17.

— — — Leche, Kgl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 54, Pl. 1, fig. 16.

*Bela* — — — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 18, Pl. 8, fig. 1 & 2, Pl. 10, fig. 9.

**Findested.** Magdalena Bay og Advent Bay, 30—60 fv. Arten er endvidere kjendt fra Murmankysten, Novaja Semlja, Karahavet, 2—60 fv. og Beringshavet. Knipowitsch angiver den som fossil fra Spitsbergen.

**Locality.** Magdalena and Advent Bay (30—60 fathoms). Further distribution — Murman Coast, Novaja Semlja, Kara Sea (2—60 fathoms), and Bering Sea. Knipowitsch mentions it as a fossil in Spitsbergen.

**Bela sarsi**, Verrill.

*Bela cancellata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 224, Pl. 23, fig. 5, Pl. VIII, fig. 9.

— *sarsi*, Verrill, Proc. U. S. Nat. Museum, vol. 3, 1880, p. 364.

— — — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 18, Pl. 8, fig. 3—5, Pl. 10, fig. 7 & 8.

**Findested.** Tromsø, 10—20 fv., der er den eneste europæiske lokalitet for denne form. Den er forøvrigt kjendt fra Labrador, 10—10 fv., New Foundlandsbanken og Grønland, 60—100 fv.

**Locality.** Tromsø (10—20 fathoms), the only European locality for this form. Other places of occurrence are Labrador (10—15 fathoms), the Newfoundland Bank, and Greenland (60—100 fathoms).

**Bela koreni**, Friele.

*Bela koreni*, Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 19, Pl. 8, fig. 23, a.

Et ikke fuldt udviklet exemplar toges paa station 192, 649 fv.

One immature specimen was found at Station 192 (649 fathoms).

**Bela harpularia**, Couthouy.

*Fusus harpularius*, Couthouy, Boston Jour. Nat. Hist., vol. 2, 1838, p. 106, Pl. 1, fig. 10.

*Defrancia woodiana*, Møller, Ind. Moll. Grønland, 1842, p. 13.

*Tritonium roseum*, Lovén, Ind. Moll. Scand., 1846, p. 12.

*Bela harpularia*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 234, Pl. 16, fig. 17, Pl. 23, fig. 10, Pl. IX, fig. 3.

— Verrill, Trans. Con. Acad., vol. 5, 1882, p. 473, Pl. 43, fig. 14, Pl. 57, fig. 9.

**Findested.** Bodø, Tromsø og Hammerfest, 10—30 fv.

**Locality.** Bodø, Tromsø, and Hammerfest (10—30 fathoms).

Arten er udbredt langs vor vest- og nordkyst fra Christiansund. Endvidere forekommer den ved de Britiske øer (var. *rosea*), Murmankysten, Hvidehavet, Novaja Semlja, Karahavet, Sibiriens ishavskyster, Beringshavet, Grønland og Nordamerikas østkyst. Den bathymetriske udbredelse er 8—368 fv. Fossil er den kjendt fra Norge og Murmankysten.

The species is distributed along the west and north coasts of Norway, beginning at Christiansund. Other places of occurrence — British Isles (var. *rosea*), Murman Coast, White Sea, Novaja Semlja, Kara Sea, Arctic shores of Siberia, Bering Sea, Greenland, and east coast of N. America. Bathymetrical distribution 8—368 fathoms. Fossil in Norway and on the Murman Coast.

#### **Bela pingelii, Beck.**

*Defrancia pingelii*, Beck, Møller, Ind. Moll. Grønl., 1842, p. 13.

*Bela* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 223, Pl. 16, fig. 5.

— — Verrill, Trans. Con. Acad., vol. 5, 1882, p. 464, Pl. 43, fig. 16.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 22, Pl. 8, fig. 26 a, Pl. 10, fig. 20 a.

**Findested.** Hammerfest, 10—20 fv. og station 262, 148 fv.

*Bela pingelii* er ikke funden søndenfor Tromsø. Udenfor Norge er den kjendt fra Murmankysten, Spitsbergen, Island, Grønland og Nordamerikas østkyst. Den bathymetriske udbredelse er 10—200 fv.

**Locality.** Hammerfest (10 to 20 fathoms) and Station 262 (148 fathoms).

*B. pingelii* is not found south of Tromsø. Occurrences besides Norway — Murman Coast, Spitsbergen, Iceland, Greenland, and east coast of N. America. Bathymetrical distribution 20—200 fathoms.

#### **Bela pyramidalis, Strøm.**

*Buccinum pyramidale*, Strøm, Ny Saml. Kgl. danske Vidensk. Selsk. Skr., vol. 3, 1788, p. 296, fig. 22.

*Defrancia rahlfi*, Beck, Møller, Ind. Moll. Grønl., 1842, p. 13.

*Bela pyramidalis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 222, Pl. 16, fig. 3.

— — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 22, Pl. 8, fig. 25, Pl. 10, fig. 21.

**Findested.** Stationerne 262, 270, 323, Lofoten, Tromsø, Hammerfest, Reykjavik. Dybde 10—223 fv. Paa dybderne mellem 147 og 223 fv. blev kun fundne døde exemplarer.

Ved den norske kyst er *bela pyramidalis* ikke funden søndenfor Lofoten. Den synes forøvrigt at være circumpolar i sin udbredelse, idet den er kjendt fra Grønland, Nordamerikas østkyst indtil Cape Cod, Jan Mayen, Island, Færøerne, Færokanalen, Murmankysten, Hvidehavet, Spitsbergen, Barentshavet, Novaja Semlja, Karahavet og Sibiriens ishavskyster. Den bathymetriske udbredelse er 2—1100 fv. Fossil er den kjendt fra Skandinavien, Britiske øer, Murmankysten, Sibirien og Labrador.

**Locality.** Stations 262, 270, and 323, Lofoten, Tromsø, Hammerfest, and Reykjavik. Depth 10—223 fathoms. Only dead specimens were found at depths between 147 and 223 fathoms.

*B. pyramidalis* is not found on the Norwegian coast south of Lofoten. It appears to be circumpolar, its distribution being Greenland, the east coast of N. America down to Cape Cod, Jan Mayen, Iceland, the Faroe Isles, the Faroe Channel, the Murman Coast, the White Sea, Spitsbergen, the Barents Sea, Novaja Semlja, the Kara Sea, and the Arctic shores of Siberia. Bathymetrical distribution 2—1100 fathoms. Fossil in Scandinavia, the British Isles, on the Murman Coast, in Siberia and Labrador.

#### **Typhlomangilia nivalis, Lovén.**

*Pleurotoma nivale*, Lovén, Ind. Moll. Scand., 1846, p. 14.

*nivalis*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 388, Pl. 91, fig. 4.

*Typhlomangilia nivalis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 241, Pl. 17, fig. 6, Pl. IX, fig. 10, Pl. XVIII, fig. 43.

**Findested.** Stationerne 8, 9, 195, 290, og Husø, 100 fv. Dybde 100—206 fv.

**Locality.** Stations 8, 9, 195, and 260, and Husø (100 fathoms). Depth 100—206 fathoms.

*Typhlomangilia nivalis* forekommer sparsomt langs den norske kyst. Endvidere er den kjendt fra Færøkanalen, Shetlandsøerne og vest af Portugal. Den bathymetriske udbredelse er 30—300 fv.

*Typhlomangilia nivalis* occurs sparingly along the Norwegian coast. Other places of occurrence — Faroe Channel, Shetland Isles, and west of Portugal. Bathymetrical distribution 30—300 fathoms.

#### **Spirotropis carinata**, Philippi.

*Pleurotoma carinatum*, Philippi, Enum. Moll. Sicil., vol. 2, 1844, p. 176, Pl. 26, fig. 19.

— *carinata*, Jeffreys, Brit. Conch. vol. 5, 1869, p. 221, Pl. 102, fig. 7.

*Spirotropis* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 242, Pl. 17, fig. 5, Pl. IX, fig. 11, Pl. XVIII, fig. 44.

**Findested.** Stationerne 79, 149, 173 b, 290 og Husø 40—60 fv. Dybde 40—300 fv.

Denne art forekommer sparsomt langs den norske kyst fra Hvitingsø til Vardo. Forøvrigt er den udbredt fra Færøkanalen til Middelhavet, vestkysten af Maroco og Canariske øer. Den bathymetriske udbredelse er 40—1080 fv. Fossil er den funden i Italien og Wienerbækkenet.

**Locality.** Stations 79, 149, 173 b, and 290, and Husø (40—60 fathoms). Depth 40—300 fathoms.

This species occurs sparsely along the Norwegian coast from Hvitingsø to Vardo. Further distribution — from the Faroe Channel to the Mediterranean, west coast of Morocco, and Canary Isles. Bathymetrical distribution 40—1080 fathoms. Fossil in Italy and the Vienna basin.

#### **Volumitra grønlandica**, Beck.

*Mitra grønlandica*, Beck, Möller, Ind. Moll. Grøn., 1842, p. 15.

*Volumitra* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 244, Pl. 23, fig. 12, Pl. IX, fig. 12.

**Findested.** Station 173 b, 300 fv. Et yngre og et ældre fuldt udviklet exemplar.

Ved den norske kyst er arten kun kjendt fra havbankerne udenfor Vesteraalen og fra Moldøen, Ytre Nordfjord, 80—100 fv. Endvidere foreligger den fra talrige stationer langs Grønlands vestkyst, samt fra Wellingtonkanalen, havet nord for Cape Cod og Island. Den bathymetriske udbredelse er 15—300 fv.

**Locality.** Station 173 b, 300 fathoms; one young and one older fully-developed specimen.

On the Norwegian coast, this species is found only on the ocean banks off Westeraalen, and at Moldøen, lower part of Nord Fjord (80—100 fathoms). There are also specimens from numerous stations along the west coast of Greenland, and from Wellington Channel, the sea north of Cape Cod, and Iceland. Bathymetrical distribution 15—300 fathoms).

#### **Metzgeria alba**, Jeffreys.

*Latirus albus*, Jeffreys, Wyville, Thomson, Depths of the Sea, 1873, p. 464.

*Meyeria albellus*, Dunker & Metzger, Zool. Ergebn. der Nordseefahrt, 1874, p. 257 & 264, Pl. 5, fig. 4.

— *pusilla*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 245, Pl. 13, fig. 8, Pl. IX, fig. 13, Pl. XVIII, fig. 45.

*Metzgeria alba*, Norman, Journ. of Conch., vol. 2, 1879, p. 56.

**Findested.** Stationerne 79 (dødt exemplar), 195 (Here døde og levende exemplarer, af hvilke det største var 22 mm. langt) og 290 (dødt exemplar). Dybde 107—191 fv.

*Metzgeria alba* forekommer sparsomt langs den norske kyst fra Lindesnæs til Øxfjord. Udenfor Norge er den kjendt fra Færøkanalen og Azorerne. Den bathymetriske udbredelse er 15—669 fv.

**Locality.** Stations 79 (dead specimen), 195 (several dead and living specimens, of which the largest was 22 mm. long), and 290 (dead specimen). Depth 107—191 fathoms.

*M. alba* occurs sparsely along the Norwegian coast from Lindesnæs to Øxfjord. It occurs, besides in Norway, in the Faroe Channel and off the Azores. Bathymetrical distribution 15—669 fathoms.



**Trophon truncatus**, Ström.

*Buccinum truncatum*, Ström, Norske Vidensk. Selsk. Skr., vol. 4, 1767, p. 369, Pl. 16, fig. 26.

*Trophon clathratus*, var. *truncata*, Jeffreys, Ann. & Mag. Nat. Hist. ser. 4, vol. 19, 1877, p. 325.

— *truncatus*, G. O. Sars, Moll. Reg. Arct. Norv., 1877, p. 246, Pl. 15, fig. 9, Pl. IX, fig. 15.

**Findested.** Station 280, 35 fv., station 322, 21 fv., Reykjavik 20 fv. og Advent Bay, 20—30 fv.

*Trophon truncatus* er kjendt fra Grønland, New England, Britiske øer, Færøerne, Island, Danmark, Skandinavien, Murmankysten, Barentshavet og Sibiriens ishavskyster. Den bathymetriske udbredelse er 2—530 fv. Fossil er den funden over en større del af Europa.

**Locality.** Stations 280 (35 fathoms) and 322 (21 fathoms), Reykjavik (20 fathoms), and Advent Bay (20—30 fathoms).

**Distribution** — Greenland, New England, British Isles, Faroe Isles, Iceland, Denmark, Scandinavia, Murman Coast, Barents Sea, and Arctic shores of Siberia. Bathymetrical distribution 2—530 fathoms. Fossil in many parts of Europe.

**Trophon clathratus**, Linné.

*Murex clathratus*, Linné, Syst. Nat., ed. 12, 1766, p. 1223.

*Trophon* — Jeffreys, Ann. Mag. Nat. Hist., ser. 4, vol. 19, 1877, p. 325.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 247, Pl. 15, fig. 10, Pl. IX, fig. 14, Pl. XVIII, fig. 46.

**Findested.** Station 173 b, 300 fv., station 290, 191 fv., station 312, 656 fv. (semifossilt skal), Sognefjord, 100 fv., Alten, 30 fv. og Hammerfest, 20 fv. Paa de fleste lokaliteter optraadte var. *gunneri*, Lovén, sammen med den typiske form.

*Trophon clathratus* er en circumpolar art, som er kjendt fra Grønland, Labrador, New England, Nordeuropa indtil Danmark og Færøkanalen, Spitsbergen, Frants Josefsland, Novaja Semlja, Karahavet, Sibiriens ishavskyster, nordvestlige Amerika, Sitka og nordlige Japan. Den bathymetriske udbredelse er 5—580 fv. Fossil er den funden i Nordeuropa, Spitsbergen, Sibirien og nordlige Grønland.

**Locality.** Stations 173 b (300 fathoms), 290 (191 fathoms) and 312 (656 fathoms; half-fossilised shell), Sogne Fjord (100 fathoms), Alten (30 fathoms), and Hammerfest (20 fathoms). In most of the localities var. *gunneri*, Lovén, appeared together with the typical form.

*T. clathratus* is a circumpolar species, with distribution — Greenland, Labrador, New England, Northern Europe down to Denmark and the Faroe Channel, Spitsbergen, Franz Josef Land, Novaja Semlja, Kara Sea, Arctic shores of Siberia, north-western America, Sitka, and northern Japan. Bathymetrical distribution 5—580 fathoms. Fossil in Northern Europe, Spitsbergen, Siberia, and north Greenland.

**Trophon clathratus**, var. **clavatus**, G. O. Sars.

*Trophon clavatus*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 249, Pl. 15, fig. 12, Pl. 23, fig. 14, Pl. IX, fig. 17.

— — Norman, Ann. Mag. Nat. Hist. ser. 6, vol. 12, 1893, p. 356.

**Findested.** Station 273, 197 fv. og Alten, 30 fv. Exemplaret fra station 273 svarer ganske til Sars's tegninger af *clavatus*, exemplarerne fra Alten viser derimod overgange til *trophon clathratus*, vi maa derfor anse *clavatus* som en varietet af denne. Den er kun kjendt fra Norges vestkyst, hvor den forekommer sparsom op til Lofoten, 120—300 fv.

**Locality.** Station 273 (197 fathoms) and Alten (30 fathoms). The specimen from Station 273 quite corresponds with Sars's drawings of *clavatus*, whereas the specimens from Alten exhibit transitions to *T. clathratus*. We must therefore regard *clavatus* as a variety of the latter. It has been found only on the west coast of Norway, where it occurs sparsely up to Lofoten (120—300 fathoms).

**Trophon barvicensis**, Johnston.

*Murex barvicensis*, Johnston, Edinb. Phil. Jour., vol. 13, 1818, p. 225.

*Trophon* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 318, Pl. 84, fig. 5.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 248, Pl. 23, fig. 13, Pl. IX, fig. 16.

**Findested.** Stationerne 173 b, 255, 260 og Husø, 100 fv. Dybde 100—341 fv.

*Trophon barvicensis* er udbredt fra Porsangerfjorden, Finmarken til Middelhavet, Adriaterhavet og Marocos vestkyst. Den bathymetriske udbredelse er 8—1042 fv. Postglacial er den funden i Norge.

**Locality.** Stations 173 b, 255, and 260, and Husø (100 fathoms). Depth 100—341 fathoms.

*T. barvicensis* is distributed from Porsanger Fjord in Finmark to the Mediterranean, the Adriatic, and the west coast of Morocco. Bathymetrical distribution 8—1042 fathoms. Post-glacial in Norway.

**Asturis rosacea**, Gould.

*Buccinum rosaceum*, Gould, Sillimans Jour., vol. 38, 1840, p. 197.

*Pyrene rosacea*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 251, Pl. 16, fig. 1, Pl. X, fig. 1, Pl. XVIII, fig. 50.

*Asturis* — Norman, Ann. Mag. Nat. Hist., ser. 7, vol. 4, 1899, p. 145.

**Findested.** Station 173 b, 300 fv., Husø, 40—60 fv. Hammerfest, 20 fv. og Norskøerne, 10—20 fv.

*Asturis rosacea* forekommer ved Grønland, Labrador, New England, Færokanalen, Norges vest- og nordkyst Murmankysten, Hvidehavet, Novaja Semlja, Spitsbergen og Alaska. Den bathymetriske udbredelse er 3—300 fv. Subfossil er den tagen ved Skotland.

**Locality.** Station 173 b (300 fathoms), Husø (40—60 fathoms), Hammerfest (20 fathoms), and the Norwegian Islands (10—20 fathoms).

Distribution — Greenland, Labrador, New England, Faroe Channel, west and north coasts of Norway, Murman Coast, White Sea, Novaja Semlja, Spitsbergen and Alaska. Bathymetrical distribution 3—300 fathoms. It has been found sub-fossil off Scotland.

**Anachis haliæti**, Jeffreys.

*Columbella haliæti*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 356, Pl. 6, fig. 5, Pl. 88, fig. 3.

*Pyrene costulata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 252, Pl. 23, fig. 16, Pl. X, fig. 2.

*Anachis haliæti*, Norman, Ann. Mag. Nat. Hist., ser. 7, vol. 4, 1899, p. 146.

**Findested.** Stationerne 18, 173 b og 192. Dybde 300—649 fv.

Professor Sars har fundet denne art ved Lofoten. Den er endvidere kjendt fra Færokanalen, Shetlandsoerne, Irlands sydvestkyst, Biskayerbugten, Middelhavet, Azorerne og Nordamerikas østkyst. Den bathymetriske udbredelse er 48—1537 fv.

**Locality.** Stations 18, 173 b, and 192. Depth 300—649 fathoms).

Professor Sars has found this species in Lofoten. Other places of occurrence — Faroe Channel, Shetland Isles, south-west coast of Ireland, Bay of Biscay, Mediterranean, Azores, and east coast of N. America. Bathymetrical distribution 48—1537 fathoms.

**Buccinum undatum**, Linné.

*Buccinum undatum*, Linné, Syst. Nat., ed. 12, 1767, p. 1204.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 254.

— — Friele, Nordhavsemp. Moll., vol. 1, 1882, p. 28.

*Forma typica*, G. O. Sars (tab. 24, fig. 2) og

Var. *pelagica*, G. O. Sars (tab. 24, fig. 4).

**Findested.** Bodø, Tromsø og Hammerfest, 20—40 fv.

*Forma typica*, G. O. Sars (Pl. 24, fig. 2), and

Var. *pelagica*, G. O. Sars (Pl. 24, fig. 4).

**Locality.** Bodø, Tromsø, and Hammerfest (20—40 fathoms).

Den norske Nordhavsempedition: H. Friele & J. A. Grieg. Mollusca III.

Var. *coerulea*, G. O. Sars (tab. 24, fig. 3) og

Var. *littoralis*, G. O. Sars (tab. 13, fig. 12).

**Findested.** Tromsø, Hammerfest og Vardø littoral, samt i Skjærstadfjorden, 30 fv.

Var. *zetlandica*, Forbes.

**Findested.** Stationerne 10, 23, 255 og 261. Dybde 80—341 fv.

*Buccinum undatum* er en circumpolar art som er udbredt fra Grønland til Cape Cod og fra Hvidehavet og Barentshavet til Middelhavet. Endvidere forekommer den ved Sibiriens ishavskyst, Beringshavet og Okotske hav. Den bathymetriske udbredelse er 0—843. Fossil er den funden i Skandinavien, Danmark, nordlige Rusland og Sibirien samt ved Palermo.

Var. *cærulea*, G. O. Sars (Pl. 24, fig. 3) and

Var. *littoralis*, G. O. Sars (Pl. 13, fig. 12).

**Locality.** Tromsø, Hammerfest, and Vardø (littoral), and in the Skjærstad Fjord (30 fathoms).

Var. *zetlandica*, Forbes.

**Locality.** Stations 10, 23, 255, and 261. Depth 80—341 fathoms.

*B. undatum* is a circumpolar species, distributed from Greenland to Cape Cod, and from the White Sea and the Barents Sea, to the Mediterranean. Other places of occurrence — Arctic shores of Siberia, Bering Sea, and Sea of Okhotsk. Bathymetrical distribution 0—843 fathoms. Fossil in Scandinavia, Denmark, northern Russia, and Siberia, and at Palermo.

### ***Buccinum ciliatum*, Fabricius.**

*Buccinum ciliatum*, Fabricius, Fau. Grønl., 1780, p. 401.

— — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 28.

— — Kobelt, Mart. Chemn. Conch. Cab., vol. 3, abth. 1, C, 1883, p. 29, tab. 78, fig. 5—8.

**Findested.** Station 322, 21 fv. og Norskøerne (opkastede paa stranden).

Var. *lævier*, Mørch.

**Findested.** Norskøerne, 10—20 fv.

Ligesom foregaaende art er *buccinum ciliatum* circumpolar, men den har en mere høiarktisk udbredelse, den er nemlig kjendt fra Grønland, Labrador, New Foundland, Nova Scotia, St. Lawrencebugten, Island, Spitsbergen, Murmankysten, Hvidehavet, Barentshavet, Novaja Semlja og Beringsstrædet. Ved vor kyst er den endnu ikke observeret. Den bathymetriske udbredelse er 2—160 fv. Fossil er den ifølge Knipowitsch funden ved Genevra Bay, Spitsbergen.

**Locality.** Station 322, (21 fathoms), and the Norwegian Islands (thrown up on the beach)

Var. *lævier*, Mørch.

**Locality.** Norwegian Islands (10—20 fathoms).

*B. ciliatum*, like the preceding species, is circumpolar, but has a more high-arctic distribution, viz. Greenland, Labrador, Newfoundland, Nova Scotia, Gnlf of St. Lawrence, Iceland, Spitsbergen, Murman Coast, White Sea, Barents Sea, Novaja Semlja, and Bering Strait. It has not yet been observed on the Norwegian coast. Bathymetrical distribution 2—160 fathoms. According to Knipowitsch, it is found as a fossil at Genevra Bay, Spitsbergen.

### ***Buccinum grønlandicum*, Chemnitz.**

*Buccinum grønlandicum*, Chemnitz, Conch. Cab., vol., 10, 1788, p. 182, fig. 1448.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 259, Pl. 13, fig. 9, Pl. 25, fig. 1 & 2, Pl. X, fig. 11.

— — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 29.

*Forma typica.*

**Findested.** Tromsø, Hammerfest og Vardø, littoral; Norskøerne, Advent Bay og Magdalena Bay, 10—60 fv.

Var. *acuta*, Friele (tab. 3, fig. 17).

**Findested.** Hammerfest, littoral.

Var. *hybrida*, Friele.

**Findested.** Hammerfest, littoral.

*Forma typica.*

**Locality.** Tromsø, Hammerfest, and Vardø (littoral), Norwegian Islands, Advent Bay, and Magdalena Bay (10—60 fathoms).

Var. *acuta*, Friele (Pl. III, fig. 17).

**Locality.** Hammerfest (littoral).

Var. *hybrida*, Friele.

**Locality.** Hammerfest (littoral).



Var. *sericata*, Hancock(?) (Friele, tab. 3, fig. 19).

**Findested.** Stationerne 192, 267 og 270. Dybde 136—649 fv.

*Buccinum grønlandicum* er en circumpolar art, som er kjendt fra Grønland, New Foundland, Nova Scotia, Labrador, Island, Jan Mayen, Spitsbergen, Frants Josefs-land, Murmankysten, Hvidehavet, Novaja Semlja, Karahavet, Sibirien ishavskyster, Beringshavet og Okotske hav. Hos os er den kun funden levende ved Tromsø og Finmarkens kyster. Den bathymetriske udbredelse er 0—250 fv. Fossil er den funden i Skandinavien, England, nordlige Rusland, Spitsbergen, Sibirien, Canada og Grønland.

Var. *sericata*, Hancock(?) (Friele, Pl. III, fig. 19).

**Locality.** Stations 192, 267, and 270. Depth 136—649 fathoms.

*B. grønlandicum* is a circumpolar species; distribution — Greenland, Newfoundland, Nova Scotia, Labrador, Iceland, Jan Mayen, Spitsbergen, Franz Josef Land, Murman Coast, White Sea, Novaja Semlja, Kara Sea, Arctic coast of Siberia, Bering Sea, and Sea of Okhotsk. In Norway it is found living only in Tromsø and on the coast of Finnmark. Bathymetrical distribution 0—250 fathoms. Fossil in Scandinavia, England, northern Russia, Spitsbergen, Siberia, Canada, and Greenland.

#### ***Buccinum undulatum*, Møller.**

*Buccinum undulatum*, Møller, Ind. Moll. Grønland, 1842, p. 11.

— *fragile*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 257, Pl. 24, fig. 6, Pl. X, fig. 8.

— *undulatum*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 30.

**Findested.** 224, 261, 321, 326 og Norskøerne, 10—15 fv. Dybde 10—127 fv.

Hos os er denne arktiske art kun kjendt fra Finnmarken. Den er forøvrigt kjendt fra Novaja Semlja, Spitsbergen og Grønland. Den bathymetriske udbredelse er 5—127 fv.

**Locality.** Stations 224, 261, 321, and 326, and Norwegian Islands (10—15 fathoms). Depth 10—127 fathoms.

In Norway, this arctic species is only found in Finnmark. Other places of occurrence are Novaja Semlja, Spitsbergen, and Greenland. Bathymetrical distribution 5—127 fathoms.

#### ***Buccinum finmarchianum*, Verkrüzen.**

*Buccinum finmarchianum*, Verkrüzen, Jahrb. Mal. Gesellsch., vol. 2, 1875, p. 237, Pl. 8, fig. 1—3.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 262, Pl. 13, fig. 10, Pl. X, fig. 12.

— — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 30.

**Findested.** Station 261, 127 fv.

Denne for Finnmarken eiendommelige art er ved vor kyst ikke funden søndenfor Tromsø. Herzenstein anfører den fra Murmankysten og Karahavet, Locard fra Biskayerbugten. Den bathymetriske udbredelse er 34—219 fv.

**Locality.** Station 261 (127 fathoms).

This species, which is peculiar to Finnmark, is not found on the Norwegian coast south of Tromsø. Herzenstein mentions its occurrence on the Murman Coast and in the Kara Sea, and Locard in the Bay of Biscay. Bathymetrical distribution 34—219 fathoms.

#### ***Buccinum humphreysianum*, Bennett.**

*Buccinum humphreysianum*, Bennett, Zool. Jour., vol. 1, 1825, p. 398, Pl. 22.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 264, Pl. 25, fig. 7 & 8, Pl. X, fig. 14.

— — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 31.

**Findested.** Station 195, 107 fv., et ungt dødt, men vel vedligeholdt exemplar.

*Buccinum humphreysianum* er udbredt fra Vestfinmarken til Gascognerbugten. Ved vor vestkyst optræder den meget lokalt og kan paa enkelte pladse, saasom i Herløfjorden være ret talrig. Den bathymetriske udbredelse er 47—215 fv.

**Locality.** Station 195 (107 fathoms; a dead, but well-preserved, young specimen).

*B. humphreysianum* is distributed from West Finnmark to the Bay of Biscay. On the west coast of Norway it is very local, and in some places, e. g. Herlø Fjord, may be quite numerous. Bathymetrical distribution 47—215 fathoms.

**Buccinum hydrophanum**, Hancock.

*Buccinum hydrophanum*, Hancock, Ann. Mag. Nat. Hist., vol. 18, 1846, p. 325, Pl. 5, fig. 7.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 261, Pl. 24, fig. 8.

— Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 31, Pl. 3, fig. 20—23.

**Findested.** Stationerne 18, 124, 164, 192, 200, 223, 251, 267, 326, 338, 363 og 366. Dybde 30—649 fv.

Foruden den typiske form, der var forholdsvis sjelden og kun forekom paa station 251, 634 fv. og station 366, 60 fv. fandtes paa de middelmaadige dyb over hele Ishavet varieteterne *tumidula* og *elata* og paa de større dyb, over 350 fv., varieteten *mørchii*.

*Buccinum hydrophanum* er en høiarktisk art som er kjendt fra Grønland, arktisk Amerika, New Foundlands-banken, Jan Mayen, Spitsbergen, Frants Josefsland, Murmankysten, Novaja Semlja, Karahavet og Sibiriens ishavskyst. Hos os er den kun funden ved Finmarken. Den bathymetriske udbredelse er 2—649 fv.

**Locality.** Stations 18, 124, 164, 192, 200, 223, 251, 267, 326, 338, 363, and 366. Depth 30—649 fathoms.

In addition to the typical form, which was comparatively rare, and occurred only at Stations 251 (634 fathoms) and 366 (60 fathoms), the varieties *tumidula*, and *elata* were found in medium depths all over the Arctic Ocean, and the variety *mørchii* in greater depths (more than 350 fathoms).

*B. hydrophanum* is a high-arctic species, with distribution — Greenland, arctic America, Newfoundland bank, Jan Mayen, Spitsbergen, Franz Josef Land, Murman Coast, Novaja Semlja, Kara Sea, and Arctic shores of Siberia. In Norway, it is found only in Finmark. Bathymetrical distribution 2—649 fathoms.

**Buccinum nivale**, Friele.

*Buccinum nivale*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 32, Pl. 3, fig. 24 & 25.

**Findested.** Station 164, 457 fv., et ungt levende exemplar.

„Dijmphna“expeditionen har den fra Karahavet, 50 fv.

**Locality.** Station 164 (457 fathoms; a young, living specimen).

The ‘Dijmphna’ found it in the Kara Sea (50 fathoms).

**Buccinum sulcatum**, Friele.

*Buccinum sulcatum*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 32, Pl. 3, fig. 18.

**Findested.** Station 192, 649 fv.

„Porcupine“expeditionen har taget denne art i 1869 paa station 65, 345 fv.

**Locality.** Stations 192 (649 fathoms).

The ‘Porcupine’ found this species in 1869 at Station 65 (345 fathoms).

**Buccinum terræ novæ**, Beck.

*Tritonium terræ novæ*, Beck, Mørch, Cat. Moll. Spitzb., 1869, p. 14.

*Buccinum* — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 33, Pl. 3, p. 13—16.

**Findested.** Station 366, 61 fv. og station 374, 60 fv.

Denne sterkt varierende art er kjendt fra Grønland, Spitsbergen, Frants Josefsland? (Mellvill & Standen som *b. totteni*), Murmanhavet, Novaja Semlja, Karahavet og Sibiriens ishavskyster. Den bathymetriske udbredelse er 4—61 fv. Knipowitsch anfører den som fossil fra Spitsbergen og Murmankysten, fra sidste lokalitet dog under tvil.

**Locality.** Stations 366 (61 fathoms) and 374 (60 fathoms).

This is an extremely variable species; distribution — Greenland, Spitsbergen, Franz Josef Land? (Mellvill & Standen as *B. totteni*), Murman Coast, Novaja Semlja, Kara Sea, and Arctic coast of Siberia. Bathymetrical distribution 4—61 fathoms. Knipowitsch mentions it as a fossil in Spitsbergen and on the Murman Coast, the latter locality, however, doubtful.

**Buccinum glaciale**, Linné.*Buccinum glaciale*, Linné, Syst. Nat., ed. 12, 1767, p. 1204.

— — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 34.

**Findested.** Stationerne 322, 366, 374, Jan Mayen og Norskøerne. Dybde 20—61 fv.*Buccinum glaciale* er kjendt fra Grønland, Jan Mayen, Spitsbergen, Barentshavet, Frants Josefsland, Murmankysten, Hvidehavet, Novaja Semlja, Karahavet, Sibiriens ishavskyster, Beringshavet, Okotske hav og Kamtschatka. Den bathymetriske udbredelse er 4—160 fv. Fossil er den funden i det nordlige Rusland og paa Spitsbergen.**Locality.** Stations 322, 366, and 374, Jan Mayen, and the Norwegian Islands. Depth 20—61 fathoms.**Distribution** — Greenland, Jan Mayen, Spitsbergen, Barents Sea, Franz Josef Land, Murman Coast, White Sea, Novaja Semlja, Kara Sea, Arctic coast of Siberia, Bering Sea, Sea of Okhotsk, and Kamtchatka. Bathymetrical distribution 4—160 fathoms. Fossil in northern Russia and Spitsbergen.**Buccinum tenue**, Gray.*Buccinum tenue*, Gray, Beechey's Voy., 1839, p. 128, Pl. 36, fig. 19.

— — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 35.

**Findested.** Stationerne 326, 357, 366, 374 og Norskøerne, 20—30 fv. Dybde 20—125 fv.

Denne art forekommer ved Grønland, arktisk Amerika indtil Halifax og Cape Sable, Spitsbergen, Frants Josefsland, europæisk og asiatisk Ruslands ishavskyster og Beringshavet. Den bathymetriske udbredelse er 2—208 fv. Fossil er den kjendt fra Island, Murmankysten, Sibirien, Canada og Labrador.

**Locality.** Stations 326, 357, 366, and 374, and the Norwegian Islands (20—30 fathoms). Depth 20—125 fathoms.**Distribution** — Greenland, arctic America down to Halifax and Cape Sable, Spitsbergen, Franz Josef Land, Arctic shores of European and Asiatic Russia, and Bering Sea. Bathymetrical distribution 2—208 fathoms. Fossil in Iceland, on the Murman Coast, in Siberia, Canada, and Labrador.**Ukko<sup>1)</sup> turtoni**, Bean.*Fusus turtoni*, Bean, Loud. Mag. Nat. Hist., vol. 7, 1834, p. 493, fig. 61.*Chrysodomus* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 269, Pl. 14, fig. 3, Pl. 25, fig. 9 & 10, Pl. X, fig. 16, Pl. XVIII, fig. 53.*Jumala* — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 6, Pl. 4, fig. 4—7.*Ukko* — Norman, Ann. Mag. Nat. Hist., ser. 6, vol. 12, 1893, p. 352.**Findested.** Stationerne 255, 257, 260, 261, 290 og 323. Dybde 127—341 fv.

Denne nordatlantiske art har sin nordgrænse ved Murmankysten og Beeren Eiland, mod syd gaar den til de Britiske øer. Hos os er den kun kjendt fra Trondhjemsfjorden og Finmarken. Desuden er den tagen ved Grønlands vestkyst. Den bathymetriske udbredelse er 5—341 fv.

**Locality.** Stations 255, 257, 260, 261, 290, and 323. Depth 127—341 fathoms.

This North Atlantic species has its northern limit at the Murman Coast and Bear Island, and extends southwards to the British Isles. In Norway it has been found in the Trondhjem Fjord and Finmark. It has also been taken on the west coast of Greenland. Bathymetrical distribution 5—341 fathoms.

<sup>1)</sup> Jeg vilde benytte navnet paa en finsk gud for denne slægt, og henvendte mig derfor til en nu afdød ven, som jeg troede var velkjendt i den lappiske gudelære. Baade *jumala*, *ukko* og flere navne blev mig opgivet. Jeg vaklede mellem de to nævnte, men valgte det første for velklangens skyld i fuldstændig uvidenhed om at jeg gjorde mig skyldig i en blasfemi. I den gamle finske mytologi var „Jumala“ himmelguden, men blev senere afløst af „Ukko“, tordenguden. Efter kristendommens indførelse blev „Jumala“ betegnelsen for de kristnes gud. Dette var jeg desværre ubekjendt med, da det lappiske og finske sprog er mig fremmed. Jeg er min ven dr. A. M. Norman taknemmelig, at han har rettet min ubehagelige fejl.

Friele.

<sup>1)</sup> Being desirous of employing the name of a Finnish god for this genus, I applied to a friend, since deceased, whom I believed to be well versed in Lapp mythology. He gave me '*jumala*', '*ukko*', and several other names. I hesitated between the two mentioned, but finally chose the first as the more euphonious, in complete ignorance of the fact that in so doing I was guilty of blasphemy. '*Jumala*', in the old Finnish mythology, was the god of heaven, subsequently the god of thunder, '*Ukko*', replaced him. After the introduction of Christianity '*Jumala*' became the designation of the god of the Christians. Of this I was unhappily ignorant, as the Lappish and Finnish languages are unknown to me. I am grateful to my friend, Dr. A. M. Norman, for correcting my unfortunate mistake.

Friele.



**Ukko ossiani**, Friele.

*Neptunea ossiani*, Friele, Jahrb. Deutsch. Mal. Gesellsch., vol. 6, 1879, p. 279.

*Jumala* — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 7, Pl. 1, fig. 1—6, Pl. 4, fig. 1—3.

*Ukko* — Norman, Ann. Mag. Nat. Hist., ser. 6, vol. 12, 1893, p. 353.

**Findested.** Stationerne 124, 164, 237 (fragmenter) ||  
og 362. Dybde 380—459 fv.

Verrill anfører den fra Nordamerikas østkyst, 180 fv.

**Locality.** Stations 124, 164, 237 (fragments), and  
362. Depth 380—459 fathoms.

Verrill states its occurrence on the east coast of  
North America, in 180 fathoms.

**Volutopsis norvegica**, Chemnitz.

*Strombus norvegicus*, Chemnitz, Conch. Cab., vol. 10, 1788, fig. 1497—1498.

*Volutopsis norvegica*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 268, Pl. 15, fig. 1, Pl. X, fig. 17, Pl. XVIII, fig. 54.

— — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 8.

**Findested.** Station 323, 223 fv. og station 333,  
146 fv.

Denne art, der hos os ikke er funden søndenfor Lofoten synes at være circumpolar. Den er kjendt fra de Britiske øer, Island, Jan Mayen, Spitsbergen, Murman-kysten, Okotske hav, nordlige Pacific, Nordamerikas østkyst og Grønland. Den bathymetriske udbredelse er 12—223 fv. Fossil er den funden i Norwich crag samt ved Uddevalla.

**Locality.** Stations 323 (223 fathoms), and 333 (146 fathoms).

This species, which is not found in Norway south of Lofoten, seems to be circumpolar. Distribution — British Isles, Iceland, Jan Mayen, Spitsbergen, Murman Coast, Sea of Okhotsk, N. Pacific, east coast of N. America, and Greenland. Bathymetrical distribution 12—223 fathoms. Fossil in the Norwich crag, and at Uddevalla.

**Pyrolofusus deformis**, Reeve.

*Fusus deformis*, Reeve, Conch. Icon., vol. 4, 1847, Pl. 12, fig. 45 a, b.

(*Pyrolofusus*) *deformis*, Mörch, Cat. Moll. Spitzb., 1869, p. 16.

*Pyrolofusus* — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 8, Pl. 1, fig. 8, Pl. 4, fig. 11—13.

**Findested.** Station 366, 61 fv., to levende exemplarer.

*Pyrolofusus deformis* er kjendt fra Spitsbergen, Novaja Semlja, Vegas vinterkvarter og Beringshavet. Den bathymetriske udbredelse er 10—61 fv.

**Locality.** Station 366 (61 fathoms; two living specimens).

*P. deformis* has been found in Spitsbergen, Novaja Semlja, the winter quarters of the 'Vega', and the Bering Sea. Bathymetrical distribution 10—61 fathoms.

**Neptunea despecta**, Linné.

*Murex despectus*, Linne, Syst. Nat., ed. 12, 1767, p. 1222.

*Neptunea despecta*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 267, Pl. 14, fig. 4, Pl. X, fig. 18, Pl. XVIII, fig. 52.

— — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 9, Pl. 1, fig. 7, Pl. 4, fig. 8—10.

*Forma typica.*

**Findested.** Stationerne 10, 255, 261, 312, 323, 326,  
357, Bodø, 10 fv., og Tromsø, 20 fv. Dybde 10—658 fv.

Var. *fasciata*, Friele.

**Findested.** Station 286. 447 fv.

Var. *fornicata*, Fabricius.

**Findested.** Reykjavik, 10—20 fv.

Var. *borealis*, Philippi.

**Findested.** Station 366, 61 fv. og station 373, 30 fv.

*Forma typica.*

**Locality.** Stations 10, 255, 261, 312, 323, 326, and  
357, Bodø (10 fathoms) and Tromsø (20 fathoms). Depth  
10—658 fathoms.

Var. *fasciata*, Friele.

**Locality.** Station 286 (447 fathoms).

Var. *fornicata*, Fabricius.

**Locality.** Reykjavik (10—20 fathoms).

Var. *borealis*, Philippi.

**Locality.** Stations 366 (61 fathoms) and 373 (30 fathoms).

Ved den norske kyst gaar denne art mod syd til Kinn, desuden er den tagen i Christianiafjorden. *Neptunea despecta* er forøvrigt circumpolar, den er kjendt fra de Britiske øer, Færøerne, Island, Jan Mayen, Spitsbergen, Frants Josefs land, Murmankysten, Hvidehavet, Barentshavet, Novaja Semlja, Sibiriens ishavskyster, Beringshavet, Japan, Grønland og Nordamerikas østkyst. Challengerexpeditionen har taget den udenfor Setubal. Den bathymetriske udbredelse er 10—658 fv. Fossil er den funden i Skandinavien, Murmankysten, Spitsbergen og Canada.

Off the coast of Norway this species extends as far south as Kinn, and is also found in the Christiania Fjord. *N. despecta* is circumpolar, with distribution — British Isles, Faroe Isles, Iceland, Jan Mayen, Spitsbergen, Franz Josef Land, Murman Coast, White Sea, Barents Sea, Novaja Semlja, Arctic shores of Siberia, Bering Sea, Japan, Greenland, and east coast of North America. The 'Challenger' found it off Setubal. Bathymetrical distribution 10—658 fathoms. Fossil in Scandinavia, on the Murman Coast, in Spitsbergen, and in Canada.

#### **Neptunea, Sipho, islandica, Chemnitz.**

*Fusus islandicus*, Chemnitz, Syst. Conch. Cab., vol. 4, 1780, p. 159, fig. 1312 & 1313.

*Sipho* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 270, Pl. 15, fig. 3, Pl. X, fig. 19, Pl. XVIII, fig. 55.

*Neptunea, Sipho, islandica*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 10, Pl. 1, fig. 9—12, Pl. 6, fig. 1 & 2.

**Findested.** Stationerne 10, 25, 124, 192, 237, 261, 286, 312, 323 og 326. Dybde 90—658 fv.

*Neptunea islandica* er udbredt fra Spitsbergen, Novaja Semlja og Murmankysten til vest af Maroco og fra Grønland til S. Carolina. Endvidere er den kjendt fra Sibiriens ishavskyster og Beringshavet. Ved den norske kyst er den ikke funden søndenfor Bergen. Den bathymetriske udbredelse er 20—1650 fv. Fossil er den funden paa Murmankysten og i Sibirien.

**Locality.** Stations 10, 25, 124, 192, 237, 261, 286, 312, 323, and 326. Depth 90—658 fathoms.

*N. islandica* is distributed from Spitsbergen, Novaja Semlja, and the Murman Coast, to the west of Morocco, and from Greenland to S. Carolina. It has also been found on the Arctic shores of Siberia, and in the Bering Sea. It is not found on the Norwegian coast south of Bergen. Bathymetrical distribution 20—1650 fathoms. Fossil on the Murman Coast and in Siberia.

#### **Neptunea, Sipho, turgidula, Jeffreys, m. s., Friele.**

*Fusus turgidulus*, Jeffreys, m. s., Friele, Nyt Mag. f. Naturvidensk., vol. 23, 1877, p. 8.

*Neptunea, Sipho, turgidula*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 11, Pl. 1, fig. 13—18, Pl. 4, fig. 14—18.

**Findested.** Stationerne 18, 33, 87, 192, 286 og 323. Dybde 223—649 fv.

Denne art blev først paavist i 1869 af Porcupineexpeditionen i Færøkanalen, 155—345 fv. Senere har Travailleurexpeditionen taget den nord for Spanien, 323—720 fv.

**Locality.** Stations 18, 33, 87, 192, 286, and 323. Depth 223—649 fathoms).

This species was first discovered in 1869, by the 'Porcupine' in the Faroe Channel (155—345 fathoms). The 'Travailleur' found it afterwards north of Spain (323—720 fathoms).

#### **Neptunea, Sipho, gracilis, da Costa.**

*Buccinum gracilis*, da Costa, Brit. Conch., 1775, p. 124, Pl. 6, fig. 5.

*Sipho glaber*, Verkrüzen, Jahrb. Deutsch. Mal. Gesellsch., vol. 3, 1876, p. 174.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 271, Pl. 15, fig. 7, Pl. X, fig. 20 & 21.

*Neptunea, Sipho, gracilis*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 1, fig. 19.

**Findested.** Stationerne 9, 23, 255, 261 og Bodø, 20 fv. Dybde 20—341 fv.

Denne art mangler ved vor sydkyst, den typiske *gracilis* optræder kun ved vestkysten, formen *glaber* derimod

**Locality.** Stations 9, 23, 255, and 261, and Bodø (20 fathoms). Depth 20—341 fathoms.

This species is absent from the south coast of Norway. The typical *gracilis* appears on the west coast

ogsaa i Lofoten og Finmarken. *Neptunea gracilis* er en østatlantisk art, som er udbredt fra Murmankysten og Island til Middelhavet og Marocos vestkyst. Den bathymetriske udbredelse er 20—718 fv. Fossil er den funden i Norge.

only, whereas the form *glaber* is also found in Lofoten and Finmark. *N. gracilis* is an east Atlantic species, distributed from the Murman Coast and Iceland to the Mediterranean and the west coast of Morocco. Bathymetrical distribution 20—718 fathoms. Fossil in Norway.

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**Neptunea, Sipho, hanseni, Friele.**

*Neptunea, Sipho, hanseni*, Friele, Jahrb. Deutsch Mal. Gesell., vol. 6, 1879, p. 281.

— — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 13, Pl. 1, fig. 20.

**Findested.** Station 374, Advent Bay, 60 fv. et død, men vel vedligeholdt exemplar.

**Locality.** Station 374, Advent Bay (60 fathoms; a dead, but well-preserved specimen).

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**Neptunea, Sipho, virgata, Friele.**

*Neptunea, Sipho, virgata*, Friele, Jahrb. Deutsch Mal. Gesell., vol. 6, 1879, p. 281.

— — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 13, Pl. 1, fig. 21—25, Pl. 4, fig. 3 & 4.

**Findested.** Station 124, 350 fv. og station 326, 123 fv.

**Locality.** Stations 124 (350 fathoms) and 326 (123 fathoms).

Under navnet *buccinum brucei* beskriver og afbilder Melvill og Standen en 41 mm. lang mollusk fra Günther-sund, Frants Josefsland<sup>1)</sup>, der sikkerlig er identisk med denne art. At dømme efter tegningen synes den kun at afvige fra *neptunea virgata* ved mere kraftige længderibber. Collin er tilbøjelig til at ville føre hid den af Pfeffer beskrevne *sipho geministriatus* fra Karahavet. Desværre har Pfeffers afhandling ikke været os tilgængelig, saa vi tør ikke udtale os herom.

Under the name *Buccinum brucei*, Melvill & Standen describe and figure a shell, 41 mm. long, from Günther Sound, Franz Josef Land<sup>1)</sup>, which is certainly identical with this species. Judging from the drawing, it seems to differ from *N. virgata* only in the more powerful longitudinal ribs. Collin is inclined to place here the *Sipho geministriatus* from the Kara Sea, described by Pfeffer. We have unfortunately not had access to Pfeffer's paper, so we will not venture to express an opinion on the matter.

*Neptunea virgata* blev tagen af Dijmphnaexpeditionen i Karahavet paa 29 favnes dyb.

*N. virgata* was taken by the Dijmphna Expedition in the Kara Sea in 29 fathoms.

**Neptunea, Sipho, curta, Jeffreys.**

*Fusus curtus*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 336.

*Neptunea, Sipho, curta*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 14, Pl. 1, fig. 26, Pl. 2, fig. 1—11, Pl. 4, fig. 5—10.

**Findested.** Stationerne 33, 124, 137, 267, 270, 312, 323, 326, 363, 370 og 374. Dybde 60—658 fv.

**Locality.** Stations 33, 124, 137, 267, 270, 312, 323, 326, 363, 370, and 374. Depth 60—658 fathoms.

Foruden fra Spitsbergen er *neptunea curta* kjendt fra Frants Josefsland, Karahavet, Sibiriens ishavskyster, det nordvestlige Atlanterhav, Nordamerikas østkyst og Grønland. Den bathymetriske udbredelse er 15—658 fv. Fossil er den funden i England, Sydsverige og Murmankysten. I Posselts udtalelser, at det af Friele valgte navn, *curta*,

Distribution — Spitsbergen, Franz Josef Land, Kara Sea, Arctic shores of Siberia, north-western Atlantic, east coast of North America, and Greenland. Bathymetrical distribution 15—658 fathoms. Fossil in England, in the south of Sweden, and on the Murman Coast. We do not altogether disagree with Posselt in thinking that the name

<sup>1)</sup> Mem. & Proc. Manchester Lit. & Philos. Soc., vol. 44, no. 4, 1899, p. 9.

<sup>1)</sup> Mem. & Proc. Manchester Lit. & Philos. Soc. Vol. XLIV, No. 4, 1899, p. 9.



Jeffreys kan være noget vilkaarlig, skal vi ikke være saa uenig. Det er imidlertid valgt fordi, hermed haabedes at bringe mindst mulig forvirring i denne hoist varierende art med det uendelig antal navne.

*curta*, Jeffreys, chosen by Friele may be somewhat arbitrary. It was chosen, however, in the hope of making as little confusion as possible in this extremely varied species with its endless number of names.

#### **Neptunea, Siphon, krøyeri, Møller.**

*Fusus krøyeri*, Møller, Ind. Moll. Grøn., 1842, p. 15.

*Neptunea, Siphon, krøyeri*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 16, Pl. 2, fig. 12—15, Pl. 4, fig. 11—15.

**Findested.** Norskøerne (paa stranden), station 366, Magdalena Bay, 60 fv. (i store mængder) og station 374, Advent Bay, 61 fv.

*Neptunea krøyeri* er kjendt fra Grønland, Labrador, St. Lawrencebugten, New Foundlandsbanken, Spitsbergen, Karahavet og Sibiriens ishavskyster. Den bathymetriske udbredelse er 5—75 fv. Fossil er den funden i Canada, Spitsbergen og ved Jenissej.

**Locality.** Norwegian Islands (on the beach), Station 366, Magdalena Bay (60 fathoms; in great quantities), and Station 374, Advent Bay (61 fathoms).

Distribution — Greenland, Labrador, Gulf of St. Lawrence, Newfoundland bank, Spitsbergen, Kara Sea, and Arctic shores of Siberia. Bathymetrical distribution 5—75 fathoms. Fossil in Canada, Spitsbergen, and by the Yenisei.

#### **Neptunæa, Siphon, latericea, Møller.**

*Fusus latericeus*, Møller, Ind. Moll. Grøn., 1842, p. 15.

*Siphon* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 276, Pl. 15, fig. 8, Pl. X, fig. 24.

*Neptunæa, Siphon, latericea*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 17, Pl. 2, fig. 16 & 17, Pl. 6, fig. 16.

**Findested.** Stationerne 192, 326, 338, 357 og Hammerfest. Dybde 20—649 fv. Variteten *lævier*, Mørch, foreligger fra station 192 og station 338.

Ved den norske kyst er denne art kun kjendt fra Tromsø og Finmarken. Forøvrigt er den kjendt fra Murmankysten, Hvidehavet, Spitsbergen, St. Lawrencebugten og Grønland. Den bathymetriske udbredelse er 5—649 fv. Fossil er den funden i Sverige.

**Locality.** Stations 192, 326, 338, and 357, and Hammerfest. Depth 20—649 fathoms. The variety *lævier*, Mørch, was found at Stations 192 and 338.

This species is found on the Norwegian coast only in Tromsø and Finmark. Other places of occurrence — Murman Coast, White Sea, Spitsbergen, Gulf of St. Lawrence, and Greenland. Bathymetrical distribution 5—649 fathoms. Fossil in Sweden.

#### **Neptunea, Siphonorbis, ebur, Mørch.**

*Fusus, Siphonorbis, ebur*, Mørch, Jour. de Conch., vol. 17, 1869, p. 398.

*Trophon sarsii*, Jeffreys, S. Wood, Suppl. to the Crag Moll., 1872, p. 25, Pl. 1, fig. 9.

*Siphon* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 275, Pl. 15, fig. 2.

*Neptunea, Siphonorbis, ebur*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 18, Pl. 2, fig. 20—23, Pl. 5, fig. 1—3.

**Findested.** Stationerne 25, 261, 290 og 323. Dybde 90—223 fv.

*Neptunea ebur* er ved den norske kyst udbredt fra Jæderen til Vadsø. Endvidere er den kjendt fra Murmankysten, Shetlandsøerne, Nordamerikas østkyst og Grønland. Den bathymetriske udbredelse er 90—2033. Fossil er den funden i den engelske crag.

**Locality.** Stations 25, 261, 290, and 323. Depth 90—223 fathoms.

*Neptunea ebur* is distributed along the Norwegian coast from Jæderen to Vadsø. Other places of occurrence — Murman Coast, Shetland Isles, east coast of North America, and Greenland. Bathymetrical distribution 90—2033 fathoms. Fossil in the English crag.

**Neptunea, Siphonorbis, fusiformis, Broderip.**

*Buccinum fusiforme*, Broderip, Zool. Journ, vol. 5, 1829, p. 45, Pl. 3, fig. 3.

*Fusus fenestratus*, Turton, Ann. Mag. Nat. Hist., vol. 7, 1832, p. 351.

*Sipho fusiformis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 277, Pl. 14, fig. 1, Pl. 4, fig. 25.

*Neptunea, Siphonorbis fusiformis*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 19.

**Findested.** Stationerne 79, 195 og 290. Dybde 107—191 fv.

Station 290 (72° 27' N. Br., 20° 51' Ø. Lg.) er nordgrænsen for denne art. Mod syd gaar den til Marocos vestkyst, desuden har „Valorous“expeditionen taget den i Davisstrædet. Ved den norske kyst er den funden fra Hardangerfjorden til Lofoten. Den bathymetriske udbredelse er 30—510 fv.

**Locality.** Stations 79, 195, and 290. Depth 107—191 fathoms.

Station 290 (72° 27' N. Lat., 20° 51' E. Long.) is the northern limit of this species, and it extends southwards to the west coast of Morocco. It was also found by the 'Valorous' in Davis Strait. It is found off the Norwegian coast from the Hardanger Fjord to Lofoten. Bathymetrical distribution 30—510 fathoms.

**Neptunea, Siphonorbis, dalli, Friele.**

*Neptunea, Siphonorbis, dalli*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 19, Pl. 2, fig. 18 & 19.

**Findested.** Station 290, 191 fv. og station 323, 223 fv. Samtlige (fire) exemplarer var døde.

Professor Sars har fundet et dødt exemplar i Varangerfjorden. „Porcupine“expeditionen har faaet den i den kolde area i Færokanalen (station 64, 640 fv.). Den østgrønlandske expedition har taget et ungt dødt exemplar i Hekla havn og 4 døde exemplarer udenfor kysten, 127 fv.

**Locality.** Stations 290 (191 fathoms) and 323 (223 fathoms). All the specimens, four in number, were dead.

Prof. Sars found a dead specimen in the Varanger Fjord, and the 'Porcupine' found it in the cold area in the Faroe Channel (Station 64; 640 fathoms). The East Greenland Expedition found a young, dead specimen in Hecla harbour, and 4 dead specimens off the coast (127 fathoms).

**Neptunea, Siphonorbis, turrita, M. Sars.**

*Tritonium turritum*, M. Sars, Christiania Vidensk. Selsk. Forhandl., 1858, p. 59.

*Sipho tortuosus*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 272, Pl. 15, fig. 4 & 5, Pl. 25, fig. 11, Pl. X, fig. 22.

*Neptunea, Siphonorbis, turrita*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 20, Pl. 2, fig. 24—27, Pl. 5, fig. 4 & 5.

**Findested.** Stationerne 18, 124, 147, 164, 192, 260, 261, 273, 323 og 363. Dybde 127—649 fv.

*Neptunea turrita* forekommer langs den norske kyst fra Bergen til Vadsø. Herzenstein anfører den fra Murmankysten og Sibiriens ishavskyster, Dall har den fra Alaska. Ligeledes er den taget ved Grønland. Den bathymetriske udbredelse er 30—649 fv.

*Fusus, sipho, turritus*, Aurivillius<sup>1)</sup> er antagelig en fra denne forskjellig art. Da vi imidlertid ikke har haft anledning at se originalexemplaret, ei heller en tegning af det, tør vi ikke have nogen mening om dens berettigelse som god art.

**Locality.** Stations 18, 124, 147, 164, 192, 260, 261, 273, 323, and 363. Depth 127—649 fathoms.

*Neptunea turrita* occurs off the Norwegian coast from Bergen to Vadsø. Herzenstein records it from the Murman Coast and the Arctic shores of Siberia, and Dall from Alaska. Further occurrence — Greenland. Bathymetrical distribution 30—649 fathoms.

*Fusus, Sipho, turritus*, Aurivillius<sup>(1)</sup>, is probably a different species; but as we have had no opportunity of seeing the original specimen, or a drawing of it, we do not venture to express an opinion with regard to its right to be called an independent species.

<sup>1)</sup> Vega Exp. Vet. Iakt., vol. 4, 1885, p. 365.

<sup>1)</sup> Vega Exp. Vet. Iakt. Vol. IV, 1885, p. 365.

**Neptunea, Siphonorbis, lachesis, Mörch.**

*Fusus, Siphonorbis, lachesis*, Mörch, Journ. de Conch., vol. 17, 1869, p. 397.

*Sipho* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 274, Pl. 15, fig. 6, Pl. X, fig. 24.

*Neptunea*, — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 21, Pl. 2, fig. 28—32, Pl. 5, fig. 6 & 7.

*Forma typica.*

**Findested.** Stationerne 18, 124, 137, 164, 192, 323, 326 og 338. Dybde 123—649 fv.

Var. *bicarinata*, Friele.

**Findested.** Station 312, 658 fv.

M. Sars har fundet denne art ved Vadso, „Dijmphna“-expeditionen i Karahavet, 81 fv. Endvidere er den kjendt fra Grønland, 80 fv.

*Forma typica.*

**Locality.** Stations 18, 124, 137, 164, 192, 323, 326, and 338. Depth 123—649 fathoms.

Var. *bicarinata*, Friele.

**Locality.** Station 312 (658 fathoms).

M. Sars found this species at Vadso, and the Dijmphna Expedition in the Kara Sea (81 fathoms). It is further known from Greenland (80 fathoms).

**Neptunea, Siphonorbis, undulata, Friele.**

*Neptunea, Siphonorbis, undulata*, Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 22, Pl. 2, fig. 33—35, Pl. 5, fig. 8.

*Sipho (Tritonofusus?) costiferus*, Posselt, Medd. om Grønland, vol. 23, 1898, p. 183, Pl. 1, fig. 6.

**Findested.** Station 290, 190 fv., et yngre exemplar og et friskt fragment af et ældre.

Ved at sammenligne Posselts beskrivelse og fortrinlige tegning af *sipho costiferus* med *neptunea undulata*, føler vi os overbevist om, at disse to arter er identiske. Posselts exemplar stammer fra Julianehaab, Vestgrønland, 170 fv.

**Locality.** Station 290 (190 fathoms; a young specimen, and a fresh fragment of an older one).

On comparing Posselt's description and excellent drawing of *Sipho costiferus* with *Neptunea undulata*, we are convinced that the two species are identical. Posselt's specimen came from Julianehaab, West Greenland (170 fathoms).

**Neptunea, Siphonorbis, danielsseni, Friele.**

*Neptunea, Sipho, danielsseni*, Friele, Jahrb. Deutsch. Mal. Gesell., vol. 6, 1879, p. 282.

— *Siphonorbis*, — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 23, Pl. 3, fig. 1—6, Pl. 5, fig. 9—11.

**Findested.** Stationerne 51 (fragmenter), 295, 303 og 353. Dybde 1110—1333 fv.

**Locality.** Stations 51 (fragments), 295, 303, and 353. Depth 1110—1333 fathoms.

**Neptunea, Mohnia, mohni, Friele.**

*Fusus mohni*, Friele, Nyt Mag. for Naturvidensk., vol. 23, 1877, p. 6.

*Neptunea, Mohnia, mohni*, Friele, Jahrb. Deutsch. Mal. Gesell., vol. 6, 1879, p. 283.

— — — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 24, Pl. 3, fig. 7—11, Pl. 5, fig. 14 & 15.

**Findested.** Stationerne 51, 54, 205, 251, 283, 295, 303, 312 og 353. Dybde 601—1333 fv.

Ogsaa „Porcupine“-expeditionen har faaet denne art paa de større havdyb i det nordlige Atlanterhav.

**Locality.** Stations 51, 54, 205, 251, 283, 295, 303, 312, and 353. Depth 601—1333 fathoms.

The 'Porcupine' also found this species at great depths in the North Atlantic.



**Troschelia berniciensis**, King

- Fusus berniciensis*, King, Ann. Mag. Nat. Hist., vol. 18, 1846, p. 246.  
*Boreofusus* — G. O. Sars, Mol. Reg. Arct. Norv., 1878, p. 278, Pl. 14, fig. 2, Pl. X, fig. 26, Pl. XVIII, fig. 56.  
*Troschelia* — Friele, Nordhavs Exp. Moll., vol. 1, 1882, p. 25.

**Findested.** Stationerne 9, 10, 23, 79 og 255. Dybde 80—341 fv. Var. *inflata* forekom paa station 10, var. *elegans* paa station 23.

*Troschelia berniciensis* er udbredt fra Hasvig, Vestfinmarken til Cap Vert, Azorerne og Canariske øer. „Valorous“expeditionen har taget den mellem Europa og Grønland. Derimod er den endnu ikke iagttaget ved Amerikas kyster. Den bathymetriske udbredelse er 50—1020 fv.

**Locality.** Stations 9, 10, 23, 79, and 255. Depth 80—341 fathoms. Var. *inflata* was found at Station 10, var *elegans* at Station 23.

*T. berniciensis* is distributed from Hasvig in W. Finmark, to Cape Verd, the Azores and the Canary Isles. The ‘Valorous’ found it between Europe and Greenland. On the other hand, it has not yet been observed on the coast of America. Bathymetrical distribution 50—1020 fathoms.

**Acera bullata**, O. F. Müller.

- Akera bullata*, O. F. Müller, Prod. Fau. Dan., 1776, p. 242.  
*Acera* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 430, Pl. 8, fig. 3.  
 — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 281, Pl. 26, fig. 1, Pl. XII, fig. 17.

**Findested.** Alten, 10 fv.

*Acera bullata* er udbredt fra Øxfjord, Vestfinmarken til Middelhavet og Madeira. Den bathymetriske udbredelse er 2—50 fv.

**Locality.** Alten (10 fathoms).

*A. bullata* is distributed from Øxfjord, W. Finmark, to the Mediterranean and Madeira. Bathymetrical distribution 2—50 fathoms.

**Cylichna alba**, Brown.

- Volvaria alba*, Brown, Ill. Conch., 1827, p. 3, Pl. 19, fig. 43 & 44.  
*Cylichna* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 417, Pl. 8, fig. 1 a, vol. 5, p. 223, Pl. 93, fig. 6.  
 — — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 283, Pl. 17, fig. 15, Pl. XI, fig. 3.

**Findested.** Stationerne 40, 79, 124, 173 b, 240, 253, 260, 261, 262, 267, 270, 273, 290, 295, 323, 326, 338, Husø 40—60 fv., Rognan, Salten, 20 fv., Tromsø, 10—20 fv., Hammerfest, 20 fv., Beeren Eiland, 18 fv., Norskøerne, 10—30 fv., Magdalena Bay, 30—60 fv., Advent Bay, 20—30 fv. Dybde 10—1181 fv. Varieteten *corticata* var hyppig ved Spitsbergen.

*Cylichna alba* er en circumpolar art, som er udbredt fra Spitsbergen, Frants Josefsland, Novaja Semlja til Azorerne og fra Grønland til Pernambuco, Brasilien. Endvidere forekommer den ved Sibiriens ishavskyster, Beringshavet, Aleuterne, nordvestlige America indtil Californien og Japan. Den bathymetriske udbredelse er 1—1366 fv. Fossil er den funden i Norge, England, Italien, Murman-kysten, Spitsbergen, Nordamerika og Kane Valley.

**Locality.** Stations 40, 79, 124, 173 b, 240, 253, 260, 261, 262, 267, 270, 273, 290, 295, 323, 326, and 338, Husø (40—60 fathoms), Rognan, Salten (20 fathoms), Tromsø (10—20 fathoms), Hammerfest (20 fathoms), Bear Island (18 fathoms), the Norwegian Islands (10—30 fathoms), Magdalena Bay (30—60 fathoms), and Advent Bay (20—30 fathoms). Depth 10—1181 fathoms. The variety *corticata* occurred frequently in Spitsbergen.

*C. alba* is a circumpolar species, distributed from Spitsbergen, Franz Josef Land, and Novaja Semlja, to the Azores, and from Greenland to Pernambuco. Other places of occurrence — Arctic shores of Siberia, Bering Sea, Aleutian Isles, north-west America down to California, and Japan. Bathymetrical distribution 1—1366 fathoms. Fossil in Norway, England, Italy, on the Murman Coast, in Spitsbergen, N. America, and the Kane Valley.

**Cylichna discus**, Watson.

*Cylichna discus*, Watson, Journ. Linn. Soc. London, vol. 17, 1883, p. 319.

— — Watson, Rep. Sci. Res. Challenger Exp. Zool., vol. 15, 1886, p. 664, Pl. 49, fig. 19.

**Findested.** Stationerne 18, 31, 51, 87, 192, 200, 240 og 295. Dybde 412—1163 fv.

Paa de største havdyb forekom *cylichna discus* ret hyppig. Den er af „Challenger“expeditionen taget ved Culebra Island, Vestindien, 390 fv., og efter meddelelse fra Jeffreys, der i sin tid havde eksemplarer fra den norske expedition til sammenligning, fandtes den af „Porcupine“expeditionen udenfor den spanske og portugisiske kyst, 304—994 fv.

De fleste eksemplarer fra de større dyb havde spiret noget eroderet, saaat flere vindinger var synlige. Hos ubeskadigede eksemplarer saaes derimod blot en fordybning. Fra *cylichna alba* afviger denne art blot ved sin forholdsvis slankere mere cylindriske form. Dog maa bemærkes at eksemplarerne fra de mindre dyb saasom station 18, 31 og 87 nærmede sig stærkt til *cylichna alba*.

**Locality.** Stations 18, 31, 51, 87, 192, 200, 240, and 295. Depth 412—1163 fathoms.

*C. discus* occurred frequently at great depths. It was found by the 'Challenger' near Culebra I. in the West Indies (390 fathoms); and according to Jeffreys, who had had specimens from the Norw. Exped. for comparison, it was found by the 'Porcupine' off the Spanish and Portuguese coast (304—994 fathoms).

The spire in most of the specimens from the greatest depths was somewhat eroded, so that several whorls were visible. In uninjured specimens, on the other hand, only a depression was to be seen. This species differs from *C. alba* in its comparatively slenderer, and more cylindrical form. It must be remarked, however, that the specimens from smaller depths, such as at Stations 18, 31, and 87, bore a strong resemblance to *C. alba*.

**Cylichna insculpta**, Totten.

*Bulla insculpta*, Totten, Sillimans Jour. of Sci., vol. 28, 1835, p. 350, fig. 4.

— — Gould, Rep. Invert. Mass., 1841, p. 162, fig. 92.

*Cylichna reinhardti*, Mørch, Rink, Dan. Greenland, 1877, p. 436.

— *solitaria*, Friele, Nyt Mag. for Naturvidensk., vol. 24, 1878, p. 5.

— *reinhardti*, Leche, Kgl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 73, Pl. 1, fig. 21.

— *occulta*, Friele, Jahrb. Deutsch. Mal. Gesell., vol. 6, 1879, p. 283.

**Findested.** Jan Mayen, 10—20 fv., Magdalena Bay, 40—60 fv. og station 366.

**Locality.** Jan Mayen (10—20 fathoms), Magdalena Bay (40—60 fathoms), and Station 366.

**Cylichna striata**, Brown.

*Bulla striata*, Brown, Ill. Conch., 1827, Pl. 38, fig. 41 & 42.

*Cylichna propinqua*, M. Sars, Christiania Vidensk. Selsk. Forhandl., 1858, p. 49.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 284, Pl. 18, fig. 5, Pl. XI, fig. 5.

— *scalpta*, Leche, Kgl. Sv. Vet. Akad. Handl., vol. 16, no. 2, 1878, p. 73, Pl. 1, fig. 22.

— *reinhardti*, Aurivillius, Vega Exp. Vet. Iakt., vol. 4, 1885, p. 370.

**Findested.** Stationerne 223, 224, 260, Tromsø og Alten, 20 fv. Dybde 20—127 fv.

Cylichnaformerne: *insculpta*, *solitaria*, *occulta*, *reinhardti* og *scalpta* bør visselig reduceres til to distincte arter, *cylichna insculpta*, Totten, og *cylichna striata*, Brown. Vor opfatning af disse to arter tror vi klart nok vil fremgaa af ovenstaaende synonymilister.

Til sammenligning med vort materiale fra Nordhavs-expeditionen har vi fra Mørch havt *cylichna insculpta* fra Grønland, fra Dall *c. solitaria* fra N. Carolina, fra Krause *c. striata* fra Beringshavet og fra professor Sars *c. pro-*

**Locality.** Stations 223, 224, and 260, Tromsø, and Alten (20 fathoms). Depth 20—127 fathoms.

The *Cylichna* forms, *insculpta*, *solitaria*, *occulta*, *reinhardti*, and *scalpta*, ought certainly to be reduced to 2 distinct species, *C. insculpta*, Totten, and *C. striata*, Brown. Our view of these species will, we think, be sufficiently intelligible from the above list of synonyms.

For the purpose of comparison with our specimens from the N. Atlantic Expedition, Mørch sent us *C. insculpta* from Greenland, Dall *C. solitaria* from N. Carolina, Krause *C. striata* from the Bering Sea, and Prof. Sars

*pingua* (typeexemplarer). Fra prof. Leche har vi endvidere havt exemplarer af hans *cylichna (utriculopsis) densistriata*, som synes at være en dvergform af *c. striata*. Muligens tør den dog gjøre fordring paa at være en distinkt art.

Jeffreys<sup>1)</sup> skjelner mellem *c. insculpta*, Totten, og *c. striata*, Brown, men vi antager, at han feiler naar han anser *c. occulta*, Mighels og *c. scalpta*, Reeve for synonym med *striata*. Leche og efter ham Posselt i sin oversigt over Grønlands brachiopoder og mollusker opstiller som selvstændige arter: *c. insculpta*, Totten, *c. reinhardti*, Möller og *c. scalpta*, Reeve. Hvad den sidste angaar, da er den efter Leches tegning (tab. 1, fig. 22) let at identificere med *c. striata*, Brown, men vi kan ikke rede ud, hvad der skulde adskille de to første. Vi tror imidlertid at Leche har misforstaaet Reeves *scalpta*, thi at dømme efter Reeves tegning<sup>2)</sup> er denne ikke identisk med *striata*, Brown, men med *insculpta*, Totten.

Aurivillius omtaler fra Vegaexpeditionen ogsaa *c. reinhardti*, *c. insculpta*, *c. scalpta*. Af disse er den første identisk med vor *striata*. Hans og vor *insculpta* synes at falde sammen. Den tredje art, *scalpta*, er det derimod ikke muligt at identificere, da den blot nævnes. Gould og Binneys *bulla occulta*<sup>3)</sup> er sikkerlig identisk med *insculpta*. Det samme gjælder disse forfatteres *bulla solitaria*. Hid hører ligeledes Krauses *cylichna striata* fra Beringshavet<sup>4)</sup> og hans *occulta* fra Spitsbergen<sup>5)</sup>. Collin synes at slaa begge arter sammen under navnet *cylichna reinhardti*<sup>6)</sup>; hans exemplarer fra Karahavet skal imidlertid ifølge Posselt svare ganske til Leches beskrivelse af *c. scalpta*, de maa saaledes være identisk med *c. striata*, Brown.

Af disse to arter er *c. striata* den eneste, der forekommer ved den norske kyst, den er dog ikke kjendt søndenfor Tromsø. *C. insculpta* optræder alene ved Spitsbergen, Nordamerikas nord- og østkyst samt i Beringshavet. Begge arter forekommer sammen ved Grønland og ved Ruslands og Sibiriens ishavskyster.

Radula hos *c. insculpta* og *c. striata* adskiller sig ikke hvad tændernes form angaar fra hinanden. Derimod er der en paafaldende afvigelse mellem kroens kalkplader hos disse to arter. *C. insculpta* har gule og temmelig tykke kalkplader; hos *c. striata* er de derimod forholdsvis mindre, brune i kjærnen og halvt gjennemsigtige ud mod randen.

*C. propinqua* (type specimens). We have also had from Prof. Leche specimens of his *C. (Utriculopsis) densistriata*, which seems to be a dwarf form of *C. striata*. It may possibly, however, have the right to be called a distinct species.

Jeffreys<sup>1)</sup> distinguishes between *C. insculpta*, Totten, and *C. striata*, Brown; but we suppose he is mistaken in considering *C. occulta*, Mighels, and *C. scalpta*, Reeve, to be synonymous with *striata*. Leche, and after him Posselt in his survey of the Brachiopoda and Mollusca of Greenland, makes *C. insculpta*, Totten, *C. reinhardti*, Möller, and *C. scalpta*, Reeve, distinct species. As regards the last of these, it is easily identified, from Leche's drawing (Pl. I, fig. 22), with *C. striata*, Brown; but we cannot find out what there is to separate the first two. We think, however, that Leche has misunderstood Reeve's *scalpta*, for judging from Reeve's drawing<sup>2)</sup>, it is not identical with *striata*, Brown, but with *insculpta*, Totten.

Aurivillius also mentions *C. reinhardti*, *C. insculpta*, and *C. scalpta* from the Vega Expedition. The first of these is identical with our *striata*, while his *insculpta* and ours seem to agree. The third species, *scalpta*, on the other hand, it is impossible to identify, as its name only is mentioned. Gould and Binney's *Bulla occulta*<sup>3)</sup> is certainly identical with *C. insculpta*, which may also be said of the same authors' *Bulla solitaria*. Krause's *C. striata* from the Bering Sea<sup>4)</sup>, and his *occulta* from Spitsbergen<sup>5)</sup> also belong to this species. Collin seems to include the two species under the name *C. reinhardti*<sup>6)</sup>; but according to Posselt, his specimens from the Kara Sea exactly correspond with Leche's description of *C. scalpta*, and must therefore be identical with *C. striata*, Brown.

*C. striata* is the only one of these two species that occurs on the Norwegian coast, and it is not found south of Tromsø. *C. insculpta* occurs alone in Spitsbergen, on the north and east coast of N. America, and in the Bering Sea. Both species occur together in Greenland, and on the Arctic shores of Russia and Siberia.

The radula in *C. insculpta* does not differ from that in *C. striata* as regards the form of the teeth; but on the other hand there is a striking difference between the calcareous plates of the gizzard in these two species. In *C. insculpta* they are yellow and rather thick, while in *C. striata* they are comparatively smaller, brown at the nucleus, and semi-transparent towards the edges.

<sup>1)</sup> Ann. Mag. Nat. Hist., ser. 4, vol. 20, 1877, p. 492. Smitt (op. cit. p. 140) anser ligeledes *cylichna striata*, Brown og *cylichna scalpta*, Reeve, for identiske.

<sup>2)</sup> Belcher, Last of arctic Voyages, App., vol. 2, 1855, p. 392, tab. 32, fig. 2.

<sup>3)</sup> Rep. Invert. Mass., ed. 2, 1870, p. 223.

<sup>4)</sup> Arch. f. Naturgesch., vol. 51, 1885, p. 293.

<sup>5)</sup> Zool. Jahrb., vol. 6, 1892, p. 363.

<sup>6)</sup> Dijnphnatogtets zool. bot. Udbytte, 1886, p. 470.

<sup>1)</sup> Ann. Mag. Nat. Hist. ser. IV, vol. XX, 1877, p. 492. Smith (l. c., p. 140), also considers *C. striata*, Brown, and *C. scalpta*, Reeve, to be identical.

<sup>2)</sup> Belcher, Last of Arctic Voyages, App. vol. 2, 1855, p. 392, Pl. XXXII, fig. 3.

<sup>3)</sup> Rep. Invert. Mass., ed. 2, 1870, p. 223.

<sup>4)</sup> Arch. f. Naturgesch., vol. LI, 1885, p. 293.

<sup>5)</sup> Zool. Jahrb., vol. VI, 1892, p. 363.

<sup>6)</sup> Dijnphna Togtets zool. bot. Udbytte, p. 470, 1886.



**Tornatina nitidula, Lovén.**

*Cylichna nitidula*, Lovén, Ind. Moll. Scand., 1846, p. 10.

— — Jeffreys, Brit. Conch., vol. 4, 1867, p. 412, Pl. 93, fig. 2.

*Utriculus* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 286, Pl. 17, fig. 13, Pl. 26, fig. 3, Pl. XI, fig. 6.

**Findested.** Station 255, Vestfjorden, 341 fv.

Denne art er udbredt fra Hammerfest til Middelhavet og Madeira. Den bathymetriske udbredelse er 3—341 fv.

**Locality.** Station 255, West Fjord (341 fathoms).

This species is distributed from Hammerfest to the Mediterranean and Madeira. Bathymetrical distribution 3—341 fathoms.

**Tornatina conula, S. Wood.**

*Bulla conulus*, S. Wood, Crag Moll., vol. 1, 1848, p. 173, Pl. 21, fig. 2.

*Utriculus* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 287, Pl. 17, fig. 17.

*Tornatina ovata*, Norman, Ann. Mag. Nat. Hist., ser. 6, vol. 6, 1890, p. 64.

**Findested.** Station 255, Vestfjorden, 341 fv.

*Tornatina conula* er udbredt fra Lofoten til Middelhavet og Azorerne, endvidere er den funden ved Nordamerikas østkyst, Floridastrædet, Culebra Island, Vestindien og ved Pernambuco, Brasilien. Den bathymetriske udbredelse er 124—1073 fv. Fossil er den funden i England og Italien.

**Locality.** Station 255, West Fjord (341 fathoms).

*Tornatina conula* is distributed from Lofoten to the Mediterranean and the Azores, other places of occurrence being the east coast of N. America, the Florida Channel, Culebra Island in the West Indies, and Pernambuco. Bathymetrical distribution 124—1073 fathoms. Fossil in England and Italy.

**Utriculus pertenuis, Mighels.**

*Bulla pertenuis*, Mighels, Proc. Boston Soc., vol. 1, 1843, p. 129.

*Utriculus* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, Pl. 17, fig. 12 & 20, Pl. XI, fig. 9.

**Findested.** Station 267, 148 fv., station 357, 125 fv., Tromsø, Hammerfest, 20 fv., Beeren Eiland, 18 fv. og Advent Bay, 20—40 fv.

*Utriculus pertenuis* er kendt fra Grønland, Nordamerikas østkyst, Tromsø, Finmarken, Murmankysten, Spitsbergen, Novaja Semlja, Sibiriens ishavskyster, Beringshavet og Aleuterne. Den bathymetriske udbredelse er 10—148 fv. Knipowitsch anfører den som fossil fra Murmankysten.

**Locality.** Stations 267 (148 fathoms) and 357 (125 fathoms), Tromsø, Hammerfest (20 fathoms), Bear Island (18 fathoms), and Advent Bay (20—40 fathoms).

Distribution — Greenland, east coast of N. America, Tromsø, Finmark, Murman Coast, Spitsbergen, Novaja Semlja, Arctic shores of Siberia, Bering Sea and Aleutian Isles. Bathymetrical distribution 10—148 fathoms. Knipowitsch mentions it as a fossil on the Murman Coast.

**Amphisphyra hyalina, Turton.**

*Bulla hyalina*, Turton, Mag. Nat. Hist., vol. 7, 1834, p. 353.

*Diaphana* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 289, Pl. 18, fig. 1, Pl. XI, fig. 10.

**Findested.** Station 195, 107 fv.

*Amphisphyra hyalina* er en nordatlantisk art som er udbredt fra Grønland til Cape Cod og fra Spitsbergen, Frants Josefsland, Hvidehavet og Murmankysten til Middelhavet, Madeira og Canariske øer. Den bathymetriske udbredelse er 1—183 fv. Fossil er den funden i Norge og Skotland.

**Locality.** Station 195 (107 fathoms).

*A. hyalina* is a North Atlantic species that is distributed from Greenland to Cape Cod, and from Spitsbergen, Franz Josef Land, the White Sea and the Murman Coast, to the Mediterranean, Madeira, and the Canary Isles. Bathymetrical distribution 1—183 fathoms. Fossil in Norway and Scotland.

**Amphisphyra expansa**, Jeffreys.

*Amphisphyra expansa*, Jeffreys, Rep. Brit. Assoc., 1864, p. 330.

*Utriculus expansus*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 426, Pl. 94, fig. 6.

*Diaphana expansa*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 289, Pl. 18, fig. 2, Pl. XI, fig. 11.

**Findested.** Husø, 100 fv.

*Amphisphyra expansa* er udbredt fra Vestfinmarken til Middelhavet. Desuden forekommer den ved Grønland. Den bathymetriske udbredelse er 10—300 fv. Fossil er den funden paa Sicilien.

**Locality.** Husø (100 fathoms).

*A. expansa* is distributed from West Finmark to the Mediterranean, and also occurs in Greenland. Bathymetrical distribution 10—300 fathoms. Fossil in Sicily.

**Amphisphyra hiemalis**, Couthouy.

*Bulla hiemalis*, Couthouy, Boston Jour. Nat. Hist., vol. 2, 1839, p. 180, Pl. 4, fig. 5.

*Amphisphyra globosa*, Lovén, Ind. Moll. Scand., 1846, p. 11.

*Diaphana* — & *hiemalis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 290 & 291, Pl. 18, fig. 3 & 4, Pl. XI, fig. 12.

**Findested.** Stationerne 124, 192, 195, 237, 240, 267, 273, 323 og 326. Dybde 107—1004 fv.

*Amphisphyra hiemalis* er kjendt fra den norske kyst, Murmankysten, Bohuslen, Shetlandsøerne, Biskayerbugten, Nordamerikas østkyst, Grønland og Beringstrædet. Den bathymetriske udbredelse er 9—1004 fv.

**Locality.** Stations 124, 192, 195, 237, 240, 267, 273, 323, and 326. Depth 107—1004 fathoms.

Distribution — Norwegian coast, Murman Coast, Bohuslän, Shetland Isles, Bay of Biscay, east coast of N. America, Greenland, and Bering Strait. Bathymetrical distribution 9—1004 fathoms.

**Bulla utriculus**, Brocchi.

*Bulla utriculus*, Brocchi, Conch. foss. Subalp., 1814, p. 633, Pl. 1, fig. 6.

— — Jeffreys, Brit. Conch., vol. 4, 1867, p. 440, Pl. 95, fig. 4.

**Findested.** Station 101, 223 fv., et ungt exemplar.

*Bulla utriculus*, som forekommer sparsom langs vor syd- og vestkyst, er sydlig udbredt til Middelhavet og Canariske øer. Den bathymetriske udbredelse er 20—223 fv. Fossil er den funden i Belgien, Frankrige, Italien og Wienerbækkenet.

**Locality.** Station 101 (223 fathoms; a young specimen).

*B. utriculus*, which occurs in small numbers along the south and west coasts of Norway, extends southwards to the Mediterranean and the Canary Isles. Bathymetrical distribution 20—223 fathoms. Fossil in Belgium, France, Italy, and the Vienna basin.

**Scaphander lignarius**, Linné.

*Bulla lignaria*, Linné, Syst. Nat., ed. 12, 1766, p. 1184.

*Scaphander lignarius*, Jeffreys, Brit. Conch., vol. 4, 1867, p. 443, Pl. 8, fig. 6, Pl. 95, fig. 5.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 292, Pl. 18, fig. 7, Pl. 26, fig. 4, Pl. XI, fig. 13.

**Findested.** Husø, 40—60 fv.

Denne art er udbredt fra Lofoten til Middelhavet. Den bathymetriske udbredelse er 8—333 fv. Fossil er den funden i Sydeuropa, Frankrig, Belgien, Tyskland og de Britiske øer.

**Locality.** Husø (40—60 fathoms).

This species is distributed from Lofoten to the Mediterranean. Bathymetrical distribution 8—333 fathoms. Fossil in Southern Europe, France, Belgium, Germany, and the British Isles.

**Scaphander puncto-striatus**, Mighels.

*Bulla puncto-striata*, Mighels, Jour. Boston Soc. Nat. Hist., vol. 1, 1841, p. 49.

*Scaphander librarius*, Lovén, Ind. Moll. Scand., 1846, p. 10.

— *puncto-striatus*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 292, Pl. 18, fig. 6, Pl. XI, fig. 14.

*Cryptaxis crebripunctatus*, Jeffreys, Proc. Zool. Soc., 1883, p. 398, Pl. 44, fig. 10.

**Findested.** Stationerne 10, 18, 124, 192, 255, 257, 260, 261, 290, 312. Husø, 40—100 fv. og Norskøerne, 10—20 fv. Dybde 10—658 fv.

*Scaphander puncto-striatus* er en nordatlantisk dybhavsart, som er udbredt fra Spitsbergen og Murmankysten til Middelhavet, Nordafrikas vestkyst, Azorerne og Sargassohavet og fra Grønland til Vestindien og Mexicanske golf. Den bathymetriske udbredelse er 20—1536 fv. Fossil er den funden paa Sicilien.

I sit arbejde over „Triton“expeditionens mollusker beskriver Jeffreys fra station 13, 570 fv., en liden gastropod, *cryptaxis crebripunctatus*, der skulde staa mellem *cylichna* og *utriculus*. Den er imidlertid kun et ungstadium af *scaphander puncto-striatus*.

A. M. Norman har allerede i „Rev. o. Br. Moll.“ gjort opmærksom paa, at Jeffreys *cryptaxis crebripunctatus* ligner *scaphander puncto-striatus*.

**Locality.** Stations 10, 18, 124, 192, 255, 257, 260, 261, 290, and 312, Husø (40—100 fathoms) and the Norwegian Islands (10—20 fathoms). Depth 10—658 fathoms.

*S. puncto-striatus* is a North Atlantic, deep-sea species, distributed from Spitsbergen and the Murman Coast to the Mediterranean, the north-west coast of Africa, the Azores, and the Sargasso, and from Greenland to the West Indies and the G. of Mexico. Bathymetrical distribution 20—1536 fathoms. Fossil in Sicily.

Jeffreys, in his work on the Mollusca of the ‘Triton’ Expedition, describes a small gasteropod, *Cryptaxis crebripunctatus*, from Station 13 (570 fathoms), which was supposed to come between *Cylichna* and *Utricularius*. It is, however, only an early stage of *Scaphander puncto-striatus*.

A. M. Norman, in his ‘Rev. o. Br. Moll.’, has already drawn attention to the likeness between *Cryptaxis crebripunctatus* and *Scaphander puncto-striatus*.

**Philine scabra**, O. F. Müller.

*Bulla scabra*, O. F. Müller, Zool. Dan., vol. 2, 1788, p. 41, Pl. 71, fig. 11 & 12.

*Philine* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 447, Pl. 96, fig. 1.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 294, Pl. 18, fig. 13, Pl. XII, fig. 4.

**Findested.** Bodo og Sognefjord, 100 fv.

*Philine scabra* er udbredt fra Vestfinmarken og Island til Middelhavet og Adriaterhavet. Den bathymetriske udbredelse er 10—720 fv. Fossil er den funden i England og Italien.

**Locality.** Bodo and the Sogne Fjord (100 fathoms).

*P. scabra* is distributed from West Finmark and Iceland, to the Mediterranean and the Adriatic. Bathymetrical distribution 10—720 fathoms. Fossil in England and Italy.

**Philine lovénii**, Malm.

*Philine lovénii*, Malm, Götheborgs Vet. Samh. Handl., 1855, p. 45, fig. 24.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 295, Pl. 26, fig. 5, Pl. XII, fig. 5.

**Findested.** Husø, 100 fv.

Denne art er kun kjendt fra den skandinaviske halvø vestkyst, hvor den er udbredt fra Bohuslän til Hammerfest. Den bathymetriske udbredelse er 30—120 fv.

**Locality.** Husø (100 fathoms).

This species has only been found on the west coast of the Scandinavian peninsula, where it is distributed from Bohuslän to Hammerfest. Bathymetrical distribution 30—120 fathoms.



**Philine finmarchica**, M. Sars.

*Philine finmarchica*, M. Sars, Christiania Vidensk. Selsk. Forhandl., 1858, p. 49.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 296, Pl. 18, fig. 19, Pl. XII, fig. 1.

**Findested.** Stationerne 124, 192, 267, 273, 326, 335, 357, 363, Alten, 30 fv. og Hammerfest, 20 fv. Dybde 20—649 fv.

*Philine finmarchica* er tidligere funden ved Lofoten, Tromsø og Finmarken samt ved Murmankysten og Karahavet. Den bathymetriske udbredelse er 10—649 fv.

**Locality.** Stations 124, 192, 267, 273, 326, 335, 357, and 363, Alten, (30 fathoms) and Hammerfest (20 fathoms). Depth 20—649 fathoms.

*P. finmarchica* has previously been found in Lofoten, Tromsø, and Finmark, and on the Murman Coast and in the Kara Sea. Bathymetrical distribution 10—649 fathoms.

**Philine fragilis**, G. O. Sars.

*Philine fragilis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 296, Pl. 18, fig. 11, Pl. XII, fig. 2.

**Findested.** Stationerne 270, 323, 338 og 363. Dybde 136—259 fv.

Vi har vel her opført *philine fragilis* som en selvstændig art, den staar dog saa nær *philine finmarchia*, at den neppe kan opretholdes, den bør snarere henføres som en varietet af denne. Den er tidligere kun kjendt fra Vadsø, 100—120 fv.

**Locality.** Stations 270, 323, 338, and 363. Depth 136—259 fathoms.

We have entered *P. fragilis* here as an independent species, but it is so near to *P. finmarchica* that it can scarcely be maintained, and ought rather to be classed as a variety of the latter. It has been found previously only at Vadsø (100—120 fathoms).

**Philine ossian-sarsi**, Friele.

*Philine ossian-sarsi*, Friele, Nyt Mag. for Naturvidensk., vol. 18, 1877, p. 9, fig. 19 a—c.

— — — Friele, Nordhavs Exp. Moll., vol. 2, 1886, p. 35, Pl. 12, fig. 9 & 10.

**Findested.** Station 18, 412 fv.

Paa station 87, 498 fv. og station 295, 1110 fv., fandtes nogle fragmenter af en *philine*, som synes at tilhøre denne art.

**Locality.** Station 18 (412 fathoms).

Some fragments of a *Philine*, apparently belonging to this species, were found at Stations 87 (498 fathoms) and 295 (1110 fathoms).

**Philine quadrata**, S. Wood.

*Bullea quadrata*, S. Wood, Ann. Mag. Nat. Hist., ser. 1, vol. 3, 1839, p. 461, Pl. 7, fig. 1.

*Philine* — Jeffreys, Brit. Conch., vol. 4, 1867, p. 452, Pl. 96, fig. 4.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 299, Pl. 18, fig. 9, Pl. XII, fig. 7.

**Findested.** Stationerne 87, 192, 195, 260, 261 og Sognefjord. 100 fv. Dybde 100—649 fv.

*Philine quadrata* er udbredt fra Murmankysten til Middelhavet og Azorerne. Endvidere forekommer den i Karahavet, Grønland og Nordamerikas østkyst. Den bathymetriske udbredelse er 3—1073 fv. Fossil er den funden i Norge, Britiske øer og Italien.

**Locality.** Stations 87, 192, 195, 260, and 261, and the Sogne Fjord (100 fathoms). Depth 100—649 fathoms.

*P. quadrata* is distributed from the Murman Coast to the Mediterranean and the Azores. Further occurrences — Kara Sea, Greenland, and east coast of N. America. Bathymetrical distribution 3—1073 fathoms. Fossil in Norway, British Isles, and Italy.

**Philine lima**, Brown.

*Utriculus lima*, Brown, Ill. Conch., 1827, Pl. 38, fig. 39 & 40.

*Bulla lineolata*, Couthouy, Boston Jour. Nat. Hist., vol. 2, 1839, p. 179, Pl. 3, fig. 15.

*Philine lima*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 300, Pl. 18, fig. 12, Pl. XII, fig. 8.

**Findested.** Advent Bay, 30—40 fv., Ulfsfjord, Kjosens, 10—15 fv., Hammerfest, 20 fv., station 260, 127 fv. og station 267, 148 fv.

*Philine lima* er kjendt fra Grønland, Nordamerikas østkyst indtil Cape Cod, Murmankysten, Spitsbergen, Frants Josefsland og Karahavet. Hos os er den tagen udenfor Storeggen samt ved Tromsø og Finnmarkens kyster. Den bathymetriske udbredelse er 10—400 fv.

**Locality.** Advent Bay (30—40 fathoms), Ulfsfjord, Kjosens (10—15 fathoms), Hammerfest (20 fathoms), and Stations 260 (127 fathoms) and 267 (148 fathoms).

Occurrence — Greenland, east coast of North America down to Cape Cod, Murman Coast, Spitsbergen, Franz Josef Land, and Kara Sea; in Norway, off Storeggen and the coast of Tromsø and Finnmark. Bathymetrical distribution 10—400 fathoms.

**A d d e n d a.****Torellia fimbriata**, Verrill & Smith.

*Torellia fimbriata*, Verrill & Smith, Trans. Con. Acad., vol. 5, 1882, p. 520, Pl. 57, fig. 27, 27 a.

Et rudiment af denne art fra station 255, 341 fv. Vestfjord er tidligere undgaaet vor opmærksomhed.

Konservator Storm har taget to store levende exemplarer i Trondhjemsfjorden. Det er en nordamerikansk form, som nu for første gang indføres i faunaen paa denne side Atlanteren.

A rudiment of this species from Station 255 (341 fathoms), Vest Fjord has hitherto escaped our attention.

Curator Storm has taken two large, living specimens in the Trondhjem Fjord. It is a North American species, which is now for the first time introduced into the fauna on this side of the Atlantic.

**Tectura fulva**, O. F. Müller.

*Pilidium* er ved en uopmærksomhed benyttet to gange som slægtsnavn, baade under fam. *patellidæ* og under *capulidæ*.

*Pilidium fulvum*, (Müll.) Forbes, p. 58, berigtiges til *tectura fulva* (Müll.) S. Wood.

Slægtsnavnet *pilidium* Forbes er offentliggjort i 1850 og saaledes af en yngre dato end *pilidium* Middendorff, „Malacozool. Ross.“ 1849. Vi maa derfor opretholde dette slægtsnavn for *pilidium radiatum*, M. Sars.

*Pilidium* has inadvertently been used twice as a generic name, viz. under the fam. *Patellidæ* and *Capulidæ*.

*Pilidium fulvum*, (Müll.) Forbes, p. 58, should be corrected to *Tectura fulva*, (Müll.) S. Wood.

The generic name *Pilidium* of Forbes was published in 1850, and is thus of more recent date than *Pilidium*. Middendorff, in the latter's „Malacozool. Ross.“, 1849. We must therefore maintain the name for *Pilidium radiatum*, M. Sars.

## Nudibranchiata.

### *Doris obvelata*, O. F. Müller.

*Doris obvelata*, O. F. Müller, Prodr. Zool. Dan., 1776, p. 229.

— *repanda*, Alder & Hancock, Brit. Nud. Moll., part. 3, 1847, fam. 1, Pl. 6.

— *obvelata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 305, Pl. XIII, fig. 3.

**Findested.** Husø, 40—60 fv.

Denne art, der er meget almindelig ved den norske kyst, er udbredt fra Spitsbergen og Novaja Semlja til Middelhavet og Adriaterhavet; endvidere forekommer den ved Nordamerikas østkyst og Grønland.

**Locality.** Husø (40—60 fathoms).

This species, which is very common on the Norwegian coast, is distributed from Spitsbergen and Novaja Semlja to the Mediterranean and the Adriatic. Other occurrences — east coast of N. America, and Greenland.

### *Lamellidoris muricata*, O. F. Müller.

*Doris muricata*, O. F. Müller, Prodr. Zool. Dan., 1776, p. 229.

— *aspersa*, Alder & Hancock, Brit. Nud. Moll., part. 6, 1854, fam. 1, Pl. 9, fig. 1—9.

*Lamellidoris muricata*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 307, Pl. XIII, fig. 6.

**Findested.** Norskøerne, 10 fv.

*Lamellidoris muricata* er udbredt fra Spitsbergen, Hvidehavet og Murmankysten til Kielerbugten og Kap Finistere. Den forekommer ogsaa ved Nordamerikas østkyst. Mørch angiver den fra Grønland, men den findes ikke optagen i Posselts oversigt over Grønlands mollusker.

**Locality.** Norwegian Islands (10 fathoms).

Distribution from Spitsbergen, the White Sea, and the Murman Coast, to Kiel Bay and Cape Finisterre; also the east coast of N. America. Mørch mentions it from Greenland, but it is not included in Posselt's list of Greenland molluscs.

### *Lamellidoris pusilla*, Alder & Hancock.

*Doris pusilla*, Alder & Hancock, Ann. Mag. Nat. Hist., vol. 16, 1845, p. 313.

— — Alder & Hancock, Brit. Nud. Moll., part. 2, 1846, fam. 1, Pl. 13.

**Findested.** Husø, 40—60 fv.

Ved den norske kyst er denne art kjendt fra Christianiafjorden og vestkysten. Endvidere er den iagttaget ved den engelske kyst.

**Locality.** Husø (40—60 fathoms).

In Norway, this species is found in the Christiania Fjord and on the west coast. It has also been observed on the English coast.



**Idalia aspersa**, Alder & Hancock.*Idalia aspersa*, Alder & Hancock, Brit. Nud. Moll., part. 1, 1845, fam. 1, Pl. 26.— *cirrigeria*, Lovén, Ind. Moll. Scand., 1846, p. 419.**Findested.** Hammerfest.

Den er kjendt fra Frankrigs vestkyst, Britiske øer og Bohuslen. Sars angiver den fra Christiansund, 50—60 fv.

**Locality.** Hammerfest.

It occurs off the west coast of France, the British Isles and Bohuslän. Sars has found it off Christiansund (50—60 fathoms).

**Ægirus punctilucens**, d'Orbigny.*Polycera punctilucens*, d'Orbigny, Mag. de Zool., vol. 7, 1837, p. 7, Pl. 107.*Ægirus* — Alder & Hancock, Brit. Nud. Moll., part. 4, 1848, fam. 1, Pl. 21.**Findested.** Husø, 40—60 fv.

Arten er udbredt fra Norges vestkyst til Frankrig. Ihering anfører den fra Middelhavet.

**Locality.** Husø (40—60 fathoms).

Distributed from the west coast of Norway to France. Ihering mentions it from the Mediterranean.

**Dendronotus frondosus**, Ascanius.*Amphitrite frondosus*, Ascanius, Kgl. norske Vid. Selsk. Skr., vol. 5, 1774, p. 114, Pl. 5, fig. 2.*Dendronotus arborescens*, Alder & Hancock, Brit. Nud. Moll., part. 1, 1845, fam. 3, Pl. 3.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 314, Pl. XV, fig. 3.

**Findested.** Station 280, 35 fv., station 322, 21 fv. og Norskoerne, 10 fv.

Paa station 322 toges sammen med den typiske form en pragtfuld orangerød varietet, som imidlertid ikke kan betragtes som en selvstændig form, da den har samme radula som den typiske.

*Dendronotus frondosus* er en circumpolar art, som er kjendt fra Nord- og Vesteuropa indtil Kielerbugten og det sydvestlige Frankrig, Jan Mayen, Spitsbergen, Novaja Semlja, Karahavet, Sibiriens ishavskyster, Beringshavet, Nordamerikas østkyst og Grønland.**Locality.** Stations 280 (35 fathoms) and 322 (21 fathoms), and the Norwegian Islands (10 fathoms).

At Station 322, a splendid orange-red variety was found together with the typical form; but it cannot be regarded as an independent form, as its radula is similar to that of the type.

*D. frondosus* is a circumpolar species; distribution — Northern and Western Europe as far as Kiel Bay and the south-west of France, Jan Mayen, Spitsbergen, Novaja Semlja, the Kara Sea, the Arctic shores of Siberia, the Bering Sea, the east coast of N. America, and Greenland.**Dendronotus robustus**, Verrill.*Dendronotus robustus*, Verrill, Am. Jour. Sci. vol. 1, 1870, p. 405.— *velifer*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 315, Pl. 28, fig. 2, Pl. XV, fig. 4.**Findested.** Station 326, 123 fv.

Denne art er kjendt fra Davisstrædet, Nordamerikas østkyst, Island og Norge, hvor Sars har taget den ved Vadsø og Lofoten, Schneider ved Tromsø og Malangen og Storm i Trondhjemsfjorden.

**Locality.** Station 326 (123 fathoms).

Distribution — Davis Strait, the east coast of N. America, Iceland, and Norway, where Sars has found it at Vadsø and Lofoten, Schneider at Tromsø and Malangen, and Storm in the Trondhjem Fjord.

**Doto coronata**, Gmelin.*Doris coronata*, Gmelin, Syst. Nat., ed. 13, 1789, p. 3105.*Doto* — Alder & Hancock, Brit. Nud. Moll., part. 2, 1846, fam. 3, Pl. 6.

— — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 317, Pl. XV, fig. 6.

**Findested.** Saltstrømmen, 90 fv. Sammen med den typiske form optraadte der en hvid varietet.*Doto coronata* er udbredt fra Havøsund, Finmarken til Middelhavet og Adriaterhavet. I Østersøen gaar den ind til Kielerbugten. Endvidere forekommer den ved Nordamerikas østkyst.**Locality.** Saltstrømmen (90 fathoms). A white variety occurred together with the typical form.*D. coronata* is distributed from Havøsund in Finmark, to the Mediterranean and the Adriatic. In the Baltic, it goes in to Kiel Bay. It also occurs on the east coast of N. America.**Cuthona aurantiaca**, Alder & Hancock.*Eolis aurantiaca*, Alder & Hancock, Ann. Mag. Nat. Hist., vol. 9, 1842, p. 34.

— — Alder &amp; Hancock, Brit. Nud. Moll., part. 5, 1851, fam. 3, Pl. 27.

*Cuthona* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 321, Pl. 28, fig. 6, Pl. XVI, fig. 7.**Findested.** Husø, 120 fv.

Sars har taget to exemplarer af denne vakre art ved Skraaven, Lofoten, 30—40 fv. Forøvrigt er den kun kjendt fra Bohuslen og de Britiske øer.

**Locality.** Husø (120 fathoms).

Sars found two specimens of this beautiful species at Skraaven, in Lofoten (30—40 fathoms). Otherwise it is known only in Bohuslän and the British Isles.

**Cratena viridis**, Forbes.*Montagua virides*, Forbes, Ann. Mag. Nat. Hist., vol. 5, 1840, p. 106, Pl. 2, fig. 18.*Eolis* — Alder & Hancock, Brit. Nud. Moll., part. 6, 1854, fam. 3, Pl. 32.**Findested.** Station 280, 35 fv. og Saltstrømmen, 90 fv.*Cratena viridis* har Friele fundet ved Bergen, men den er ikke tidligere optagen i Norges fauna, derimod er den funden paa en række lokaliteter ved den engelske kyst.**Locality.** Station 280 (35 fathoms) and Saltstrømmen (90 fathoms).Friele has taken *C. viridis* at Bergen but it had not previously been found among the fauna of Norway. It is found in a number of localities on the English coast.**Cratena concinna**, Alder & Hancock.*Eolis concinna*, Alder & Hancock, Ann. Mag. Nat. Hist., vol. 12, 1843, p. 234.

— — Alder &amp; Hancock, Brit. Nud. Moll., part. 1, 1845, fam. 3, Pl. 24.

**Findested.** Station 280, Beeren Eiland, 35 fv.

Arten er tidligere kjendt fra vor vestkyst, Christianiafjorden og de Britiske øer.

**Locality.** Station 280, Bear Island (35 fathoms).

The species was previously known on the west coast of Norway, in the Christiania Fjord, and in the British Isles.

**Tergipes despectus**, Johnston.*Eolidia despecta*, Johnston, Lond. Mag. Nat. Hist., vol. 8, 1835, p. 378, fig. 35.*Eolis* — Alder & Hancock, Brit. Nud. Moll., part. 1, 1845, fam. 3, Pl. 36.**Findested.** Husø, littoral.

Denne art er kjendt fra Norges vestkyst, Britiske øer og Nordamerikas østkyst.

**Locality.** Husø (littoral).

This species is found on the west coast of Norway, the east coast of N. America, and in the British Isles.

**Galvina exigua**, Alder & Hancock.*Eolis exigua*, Alder & Hancock, Ann. Mag. Nat. Hist., ser. 2, vol. 1, 1848, p. 292.

— Alder &amp; Hancock, Brit. Nud. Moll., part. 5, 1851, fam. 3, Pl. 37.

**Findested.** Husø, littoral.

Foruden ved Norges vestkyst og Finmarken er *galvina exigua* funden ved Bohuslen, Danmark, Kielerbugten, Britiske øer, Adriaterhavet, Hvidehavet og Novaja Semlja. Den af M. Sars omtalte *tergipes lacinulatus* fra Finmarken er ifølge G. O. Sars denne art.

**Locality.** Husø (littoral).

Distribution — besides the west coast of Norway and Finmark — Bohuslän, Denmark, Kiel Bay, the British Isles, the Adriatic, the White Sea, and Novaja Semlja. According to G. O. Sars, the *Tergipes lacinulatus* from Finmark, described by M. Sars, is this species.

**Galvina picta**, Alder & Hancock.*Eolis picta*, Alder & Hancock, Brit. Nud. Moll., part. 3, 1847, fam. 3, Pl. 33.**Findested.** Husø, littoral.

Foruden ved Norges vestkyst, hvor den først paavistes af Hansen og Friele ved Florø, er *galvina picta* funden ved England, Genua, Adriaterhavet og Nordamerikas østkyst.

**Locality.** Husø (littoral).

Occurrences — besides the west coast of Norway, where it was first pointed out by Hansen & Friele at Florø — England, Genoa, the Adriatic, and the east coast of N. America.

**Coryphella rufibranchialis**, Johnston.*Eolidia rufibranchialis*, Johnston, Loud. Mag. Nat. Hist., vol. 5, 1832, p. 428.*Eolis* — Alder & Hancock, Brit. Nud. Moll., part. 4, 1848, fam. 3, Pl. 14.*Coryphella* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 319, Pl. XVI, fig. 1.**Findested.** Station 322, 21 fv.

*Coryphella rufibranchialis* er udbredt fra Finmarken til Kielerbugten og Middelhavet. Endvidere forekommer den ved Nordamerikas østkyst og i Beringshavet.

**Locality.** Stations 322 (21 fathoms).

Distributed from Finmark to Kiel Bay and the Mediterranean. Further occurrences — the east coast of N. America, and the Bering Sea.

**Coryphella salmonacea**, Couthouy.*Eolis salmonacea*, Couthouy, Boston Jour. Nat. Hist., vol. 2, 1839, p. 68, Pl. 1, fig. 2.*Coryphella* — Bergh, Kgl. danske Vid. Selsk. Skr., R. 5, Bd. 7, 1868, p. 227, Pl. 4.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 319, Pl. 28, fig. 4, Pl. XVI, fig. 3.

**Findested.** Norskøerne, 5—10 fv., Advent Bay, 20—30 fv., Hammerfest, 20 fv. og station 322, 21 fv.

Den er en høiarktisk art, som er udbredt fra Discovery Bay til Karahavet. Sydgrænsen for dens udbredelse er ved Aalesund og Cape Cod.

**Locality.** Norwegian Islands (5—10 fathoms), Advent Bay (20—30 fathoms), Hammerfest (20 fathoms), and Station 322 (21 fathoms).

This is a high arctic species, distributed from Discovery Bay to the Kara Sea. Its southern limit is at Aalesund and Cape Cod.

**Coryphella pellucida**, Alder & Hancock.*Eolis pellucida*, Alder & Hancock, Ann. Mag. Nat. Hist., vol. 12, 1843, p. 234.

— Alder &amp; Hancock, Brit. Nud. Moll., part. 3, 1848, fam. 3, Pl. 19.

**Findested.** Husø, 60 fv.

Arten er kjendt fra Norges vestkyst, Christianiafjorden og England.

**Locality.** Husø (60 fathoms).

Distribution — the west coast of Norway, the Christiania Fjord, and England.



**Coryphella lineata**, Lovén.*Æolis lineata*, Lovén, Ind. Moll. Scand., 1846, p. 8.*Eolis* — Alder & Hancock, Brit. Nud. Moll., part. 5, 1851, fam. 3, Pl. 16.**Findested.** Husø, 50—60 fv.

Sars har taget denne art ved Lofoten, Schneider ved Tromsø. Den er sydlig udbredt til Middelhavet.

**Locality.** Husø (50—60 fathoms).

Sars found this species in Lofoten, and Schneider in Tromsø. It extends southwards to the Mediterranean.

**Facelina drummondi**, W. Thompson.*Eolis drummondi*, Thompson, Rep. Brit. Assoc., 1843, p. 89.

— — Alder &amp; Hancock, Brit. Nud. Moll., part. 4, 1848, fam. 3, Pl. 13.

**Findested.** Saltstrømmen, 90 fv.

Hos os er denne art kun kjendt fra vestkysten. Den gaar mod syd til Kielerbugten og Middelhavet.

**Locality.** Saltstrømmen (90 fathoms).

In Norway, this species is found only on the west coast. It extends southwards to Kiel Bay and the Mediterranean.

**Hero formosa**, Lovén.*Cloelia formosa*, Loven, Sv. Kgl. Vet. Akad. Förhand., vol. 1, 1844, p. 49.*Hero* — G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 316, Pl. 28, fig. 3, Pl. XV, fig. 5.**Findested.** Husø, 50 fv., tre exemplarer.

Ved denne lokalitet er arten senere gjenfunden af Grieg paa 150 favnes dyb. Den er forøvrigt kjendt fra Christianiafjorden, Mandal, Lofoten og Tromsø. Udenfor Norge er den funden ved Bohuslen, Sjælland og de Britiske øer.

**Locality.** Husø (50 fathoms; 3 specimens).

The species was subsequently again found by Grieg in this locality, at a depth of 150 fathoms. Other occurrences — the Christiania Fjord, Mandal, Lofoten, and Tromsø; and out of Norway — Bohuslän, Zealand, and the British Isles.

**Hermæa dendritica**, Alder & Hancock.*Calliopæa dendritica*, Alder & Hancock, Ann. Mag. Nat. Hist., vol. 12, 1843, p. 223.*Hermæa* — Alder & Hancock, Brit. Nud. Moll., part. 4, 1848, fam. 3, Pl. 40.**Findested.** Husø, littoral.Foruden fra denne lokalitet er *hermæa dendritica* kun kjendt fra Bukken, et par mil syd for Bergen. Udenfor Norge er den funden ved Bohuslen, England, Middelhavet og Adriaterhavet.**Locality.** Husø (littoral).In addition to this locality, *H. dendritica* was only found at Bukken, some 15 miles south of Bergen. Occurrences out of Norway — Bohuslän, England, the Mediterranean, and the Adriatic.**Actæonia corrugata**, Alder & Hancock.*Actæonia corrugata*, Alder & Hancock, Ann. Mag. Nat. Hist., ser. 2, vol. 1, 1848, p. 403, Pl. 19, fig. 2 & 3.**Findested.** Husø, littoral.

Arten er kun kjendt fra Norges vestkyst og England.

**Locality.** Husø (littoral).

The only occurrences known are the west coast of Norway and England.

## Pteropoda.

### *Clione limacina*, Phipps.

*Clio limacina*, Phipps, Voy. towards the North Pole, 1774, p. 195.

*Clione borealis*, Pallas, Spic. Zool., fasc. 10, 1774, p. 28, Pl. 1, fig. 18 & 19.

— *limacina*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 332, Pl. 29, fig. 4, Pl. XVI, fig. 21.

— — Boas, Pteropodernes Morf. & Syst., 1886, p. 162, Pl. 7, fig. 101—103.

*Clione limacina* fandtes talrig af Nordhavsexpeditionen ved Jan Mayen og Spitsbergen. Et exemplar toges desuden paa station 51. Den er en arktisk art som er udbredt fra Grønland til New York og fra Karahavet, Novaja Semlja og Spitsbergen til Lille Belt, Kattegat og Falmouth. Ligeledes forekommer den i Beringshavet. Ved vor kyst er den ikke observeret søndenfor Karmøen. I enkelte aar, saaledes høsten 1898, kan den optræde talrig i de bergenske fjorde.

*Clione limacina* was found in great numbers by the North Atlantic Expedition off Jan Mayen and Spitsbergen. One specimen was also found at Station 51. It is an arctic species, distributed from Greenland to New York, and from the Kara Sea, Novaja Semlja, and Spitsbergen, to the Little Belt, the Kattegat, and Falmouth. It also occurs in the Bering Sea. It has not been observed on the Norwegian coast south of Karmøen. In certain years, as in the autumn of 1898, it appears in great numbers in the Bergen fjords.

### *Limacina helicina*, Phipps.

*Clio helicina*, Phipps, Voy. towards the North Pole, 1774, p. 195.

*Limacina helicina*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 328, Pl. 29, fig. 4, Pl. XVI, fig. 21.

— — Boas, Pteropodernes Morf. & Syst., 1886, p. 40, Pl. 5, fig. 69 & 70.

**Findested.** Stationerne 222, 240 og 280. Den optraadte i umaadelige masser ved Jan Mayen og Spitsbergen, hvor den forekom saavel ude ved havet som inde i fjordene.

*Limacina helicina* er en circumpolar art, som inden Atlanterhavsomraadet er truffet saa langt syd som ved Gascognerbugten og kysten af Provence, inden Pacifikomraadet i det Okotske hav og ved det nordvestlige Amerika. Hos os er den kun observeret ved Finnmarken.

**Locality.** Stations 222, 240, and 280. It occurred in immense numbers at Jan Mayen and Spitsbergen, both out in the open sea, and in the fjords.

*L. helicina* is a circumpolar species, which, in the Atlantic, is met with as far south as the Bay of Biscay and the coast of Provence, and in the Pacific in the Sea of Okhotsk and north-western America. In Norway it has only been observed in Finnmark.

**Limacina balea, Møller.**

*Limacina balea*, Møller, Ind. Moll. Grønl., 1842, p. 4.

*Spirialis balea & retroversa*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 329 & 330, Pl. 29, fig. 2 & 3, fig. 18 & 19.

*Limacina balea*, Boas, Pteropodernes Morf. & Syst., 1886, p. 43.

**Findested.** Stationerne 18, 40, 87, 101, 124, 164, 192 og 248.

*Limacina balea* er en nordatlantisk art, som er kjendt fra Grønland, Nordamerikas østkyst og de europæiske kyster, hvor den er udbredt fra Island og Finmarken til Middelhavet og de Canariske øer. I Østersøen er den funden helt inde i Kielerbugten. I de bergenske fjorde kan den undertiden optræde i store masser.

**Locality.** Stations 18, 40, 87, 101, 124, 164, 192, and 248.

*L. balea* is a North Atlantic species, found in Greenland, on the east coast of North America and the shores of Europe, where it extends from Iceland and Finmark to the Mediterranean and the Canary Isles. In the Baltic it is found right inside Kiel Bay. In the Bergen fjords, it sometimes appears in great numbers.

**Cleodora pyramidata, Linné.**

*Clio pyramidata*, Linné, Syst. Nat., ed. 12, 1767, p. 1094.

*Cleodora* — Boas, Pteropodernes Morf. & Syst., 1886, p. 69, Pl. 4, fig. 47, Pl. 5, fig. 84—86, Pl. 6, fig. 96 & 97.

**Findested.** Stationerne 9, 10, 79, 124, 192 og 248.

Denne pteropod er en kosmopolitisk art, som hos os tidligere kun har været kjendt fra vestkysten.

**Locality.** Stations 9, 10, 79, 124, 192, and 248.

This pteropod is a cosmopolitan species, which, in Norway, has formerly been found only on the west coast.

**Cavolinia trispinosa, Lesueur.**

*Hyalæa trispinosa*, Lesueur, m. s., Bainville, Dict. des Sci. Nat., vol. 22, 1821, p. 82.

— — Boas, Pteropodernes Morf. & Syst., 1886, p. 94, Pl. 1, fig. 3, Pl. 2, fig. 14, Pl. 4, fig. 52, Pl. 5, fig. 93.

Et 10 mm. langt skal toges paa station 192, 649 fv.

Ligesom foregaaende art er *cavolinia trispinosa* kosmopolitisk, dog gaar den ikke saa langt mod nord. Ved den norske kyst vides arten ikke tidligere observeret.

A shell, 10 mm. long, was found at Station 192 (649 fathoms).

*Carolina trispinosa*, like the preceding species, is cosmopolitan, though not extending so far north. The species has not been previously observed on the Norwegian coast.



# Cephalopoda.

## *Cirrotheutis mülleri*, Eschricht.

*Cirrotheutis mülleri*, Eschricht, Nova Acta Acad. Cæs. Leop. Carol., vol. 18, 1836, p. 627, Pl. 46—48.

*Sciadephorus* — Reinhardt & Prosch, Kgl. danske Vidensk. Selsk. Skr., vol. 12, 1846, p. 185, Pl. 1—5.

Et middelstort exemplar toges paa station 297, 1280 fv. Ogsaa under anden Nordhavsekspektion i 1900 erholdtes denne art. Den er tidligere kun kjendt fra Grønland.

A medium-sized specimen was taken at Station 297 (1280 fathoms). The species was also found during the second North Atlantic expedition in 1900. It was previously only found in Greenland.

## *Octopus arcticus*, Prosch.

*Octopus arcticus*, Prosch, Kgl. danske Vidensk. Selsk. Skr., ser. 5, math.-naturv. Afd., vol. 1, 1847, p. 53, fig. 1—3.

— *bairdii*, Verrill, Amer. Jour. Sci., vol. 5, 1873, p. 5.

— G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 339, Pl. 33, Pl. XVII, fig. 8.

**Findested.** Station 124, 350 fv., station 290, 191 fv. og station 359, 411 fv.

*Octopus arcticus* er kjendt fra Grønland, Nordamerikas østkyst, 45—524 fv., Færøkanalen, 345—632 fv., Skagerak, Bohuslän og Norge, hvor den er tagen ved Hvitingsø, Bergen, Trondhjemsfjorden, Lofoten og Finmarken, 60—300 fv.

**Locality.** Stations 124 (350 fathoms), 290 (191 fathoms) and 359 (411 fathoms).

Occurrences — Greenland, east coast of North America (45—524 fathoms), Farøe Channel (345—632 fathoms), Skagerak, Bohuslän, and Norway, where it is found at Hvitingsø, Bergen, in the Trondhjem Fjord, Lofoten, and Finmark (60—300 fathoms).

## *Octopus lentus*, Verrill.

*Octopus lentus*, Verrill, Amer. Jour. Sci., vol. 19, 1880, p. 138 & 294.

— — Verrill, Trans. Con. Acad., vol. 5, 1881, p. 375, Pl. 35, fig. 1 & 2, Pl. 51, fig. 2

— — Appelløf, Bergens Museums Aarbog, 1892, no. 1, p. 4.

**Findested.** Station 124, 350 fv., et exemplar.

Arten er kjendt fra Nordamerikas østkyst, 120—602 fv. Endvidere er for nogle aar siden et exemplar taget i Bergensfjorden, 200—350 fv.

**Locality.** Station 124 (350 fathoms; one specimen).

Found on the east coast of North America (120—602 fathoms). A specimen was also taken a few years ago in the Bergen Fjord (200—350 fathoms).

**Eledone, sp.**

Et ganske ungt, 7 mm. langt exemplar af denne slægt toges paa station 34, 587 fv. Hvorvidt exemplaret er et ungstadium af *eledone cirrhosa* eller om den tilhører en anden art, lader sig vanskelig bestemme.

Quite a young specimen of this genus, 7 mm. long, was taken at Station 34 (587 fathoms). It is not easy to determine whether this is a young specimen of *Eledone cirrhosa*, or belongs to some other species.

**Rossia glaucopis, Loven.**

*Rossia glaucopis*, Lovén, Ind. Moll. Scand., 1846, p. 3.

— *papillifera*, Jeffreys, Brit. Conch., vol. 5, 1869, p. 134.

— *glaucopis*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 337, Pl. 32, Pl. XVII, fig. 5.

Et større exemplar erholdtes paa hver af stationerne 270, 136 fv., 290, 191 fv. og 326, 123 fv. Eg toges paa station 323, 223 fv.

*Rossia glaucopis* er kjendt fra Grønland, Færøkanalen, 345 fv., Shetlandsøerne, 60—100 fv., Bohuslen og Norge, hvor den faaes ikke sjelden paa 60—300 favnes dyb langs hele kysten.

One large specimen was found at each of the three stations, 270 (136 fathoms), 290 (191 fathoms), and 326 (123 fathoms). Eggs were found at Station 323 (223 fathoms).

Occurrences — Greenland, Faroe Channel (345 fathoms), Shetland Isles (60—100 fathoms), Bohuslän and Norway (not uncommon at 60—300 fathoms all along the coast).

**Rossia palpebroso, Owen.**

*Rossia palpebroso*, Owen, Ross' 2nd Voy, App., 1835, p. 92, Pl. B, fig. 1, Pl. C.

— — Appellof, Bergens Museums Aarbog, 1892, no. 1, p. 7. fig. 7.

— — Posselt, Conspectus Fau. Grönl., Brach. & Moll. 1898, p. 271.

En hun, 18 mm. lang, toges paa station 363, 260 fv.

Foruden fra denne lokalitet er *rossia palpebroso* kun kjendt fra Grønland og Karahavet.

A female, 18 mm. long, was taken at Station 363 (260 fathoms).

In addition to this locality, Greenland and the Kara Sea are the only places in which *R. palpebroso* has been found.

**Gonatus fabricii, Lichtenstein.**

*Onychoteuthis fabricii*, Lichtenstein, Sepien mit Krallen, 1818, p. 13.

*Gonatus* — Mørch, Rink, Dan. Greenland, 1877, p. 440.

— *amoenus*, G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 336, Pl. 31, Pl. XVII, fig. 2.

— *fabricii*, Appellof, Bergens Museums Aarbog, 1892, p. 9, fig. 1—3, 5 & 6, 8.

— — Posselt, Conspectus Fau. Grönl., Brach. & Moll., 1898, p. 279.

Et lidet exemplar erholdtes ved Jan Mayen.

Hos os er denne art kun kjendt fra Kistrand i Porsangerfjorden, hvorfra Professor Collett har hjembragt et exemplar. *Gonatus fabricii* er forøvrigt kjendt fra Grønland, Nova Scotia, nordlige Atlanterhav, Island, Færøerne, Midelhavet, Kamtschatka og Japan. Steenstrup anfører den syd for Kap det gode haab.

A small specimen was found off Jan Mayen.

Kistrand in the Porsanger Fjord is the only place in Norway where this species is known, Professor Collett having found specimens there. Other occurrences — Greenland, Nova Scotia, the North Atlantic, Iceland, the Faroe Isles, the Mediterranean, Kamtschatka, and Japan. Steenstrup records it from south of the Cape of Good Hope.

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<i>Mya truncata</i> , Lin. . . . .	16	— <i>incomparabilis</i> , Risso. . . . .	10
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— <i>bathybii</i> , Friele . . . . .	70	— <i>similis</i> , Laskey . . . . .	9
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— <i>nana</i> , Möll. . . . .	69	— <i>sulcatus</i> , O. F. Müll. . . . .	12
— <i>pallida</i> , Brod. & Sow. . . . .	69	— <i>tigrinus</i> , O. F. Müll. . . . .	10
<i>Neatritia gnomon</i> , Jeffr. . . . .	1	— <i>vitreus</i> , Chemn. . . . .	10
<i>Neera abbreviata</i> , Forbes. . . . .	11	<i>Pelecypoda</i> . . . . .	5
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— <i>costellata</i> , Desh. . . . .	11	— <i>fragilis</i> , G. O. Sars . . . . .	114
— <i>exigua</i> , Jeffr. . . . .	10	— <i>lima</i> , Brown . . . . .	115
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— <i>dalli</i> , Friele . . . . .	106	<i>Poromya granulata</i> , Nyst. & West. . . . .	42
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— <i>despecta</i> , Lin. . . . .	102	— <i>expansa</i> , Jeffr. . . . .	17
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Kemiske undersøgelser af skaller af molusker og af torrede echinodermer.

Chemical Examination of Shells of Mollusca and of Dried Echinoderms.

Analyserne er beregnede paa den ved 100° C. tørrede substans. Hvad der er optørt som sauleet mængde af organisk stof, er glødnings- tabet minus kulsyren, der er bestemt vegtanalytisk. Under *a* er opgivet det i saltsyre uopløste organiske stof, under *b* det opløste.

The analyses are referred to substance dried at 100° C. The 'Total' of organic substance is the loss by ignition minus the carbon dioxide, determined by weighing. Under *a* is given the organic substance not dissolved in hydrochloric acid, under *b* the substance dissolved.

Navn.  (Name).	Sted.  (Locality).	Kulsur kalk.  (Carbonate of lime).	Svovlsur kalk.  (Sulphate of lime).	Kulsur magnesia.  (Carbonate of magnesia pet.	Strontian.  (Strontian).	Jern som jernoxyd.  (Iron as Sesqui- oxide).	Lerjord.  (Alumina).	Kiselsyre.  (Silica).	Fosfatsyre.  (Phosphoric Acid).	Organisk stof				Sum.
										a.	b.	Samlet.		
													(Organic Substance)	
		pet.	pet.	pet.		pet.		pet.	pet.	pet.	pet.	(Total).		
<i>Buccinum undatum</i> . .	Vardo . .	95.69	0.51	0.26		0.35		0.15	Spor (Traces)	0.20	2.55	2.75	99.71	
<i>Do.</i> . .	Lofoten . .	97.95	Spor (Traces)	0.38	Spor (Traces)	0.25		0.15	Do.	0.10	0.81	0.91	99.63	
<i>Do. gracilicolum</i>	Hammerfest	91.76	0.51	0.74		0.30		0.30	Do.	2.87	3.28	6.15	99.76	
<i>Do.</i> . .	Vadso . .	94.57	Spor (Traces)	0.45	Spor (Traces)	0.20		0.20	0.13	1.90	2.04	3.94	99.29	
<i>Do. glaciale</i> . .	Station 250	95.69	0.51	0.78		0.25		0.10	Spor (Traces)	0.20	2.08	2.28	99.61	
<i>Astarte borealis</i> . . .	Spitsbergen	90.14	0.62	0.15		0.85		2.45	Do.	2.60	2.07	4.67	99.88	
<i>Do.</i> . . . .	Finmarken	96.97	Spor (Traces)	0.29	Spor (Traces)	0.15		0.25	Do.	1.10	1.58	2.68	99.44	
<i>Do. crenata</i> . . .	Hammerfest	95.89	Do.	0.34		0.20	Spor (Traces)	0.15	Do.	0.80	2.30	3.10	99.68	
<i>Do.</i> . . . .	Station 261	95.51	0.40	0.31		0.80	Do.	0.70	Do.	0.82	1.80	2.62	100.34	
<i>Do. acuticostata</i> . .	Station 192	95.23	Spor (Traces)	0.69		0.43	Do.	0.43	Do.	0.66	3.06	3.72	100.50	
<i>Neptunea despecta</i> . .	Station 323	96.30	0.25	0.55		0.50		0.45	Do.	0	1.71	1.71	99.96	
<i>Do.</i> . . . .	Lofoten . .	97.58	0.53	0.65	Spor (Traces)	0.20		0.10	Do.	0.10	0.83	0.93	99.98	
<i>Waldheimia crania</i> . .	Station 255	96.20	0.85	1.20		0.40		0.60	Do.	0	1.24	1.24	100.49	
<i>Do.</i> . . . .	Lofoten . .	95.98	?	1.40	Spor (Traces)	0.15		?	0.12	0	1.99	1.99	99.64	
<i>Pecten islandicus</i> . .	Bodø . . . .	97.70	0.90	0.58		0.25		0.15	Spor (Traces)		?			
<i>Do.</i> . . . .	Bodø . . . .	97.71	0.93	0.57		0.20		0.15	Do.	0.10	0.61	0.71	100.57	
<i>Astartophyton</i> . . . .	Station 370	74.82	0.71	7.60		0.31	Spor (Traces)	Spor (Traces)	Do.	7.75	9.82	17.57	97.91	
<i>Arcastraea tenuispina</i> .	Station 25 .	74.11	?	9.36		0.30	Do.	Do.	Do.	5.90		16.23*	(100.00)	
<i>Do.</i> . . . .	Station 10 .	78.92	1.00	9.21		0.60	Do.	Do.	Do.	8.80		10.24*	(100.00)	
<i>Astropecten andromeda</i>	Station 10 .	64.48	0.83	8.55		0.37	0.65	7.09	Do.	7.38	6.45	13.83	95.80	
<i>Echinus Drobakiensis</i> .	Station 372	77.75	Spor (Traces)	5.30		0.30	Spor (Traces)	Spor (Traces)	Do.	7.82	8.51	16.33	99.67	

Computed as difference.

Beregnet som differents.

Zoologiske Stationer.  
(Zoological Stations.)

Station No.	Datum. (Date.)	Nordlig Bredde. (North Latitude.)	Længde fra Greenwich. (Longitude.)	Dybde. (Depth.)		Bundens Temperatur. (Temperature at Bottom.) C.	Bunden.	Bottom.	Apparat. (Apparatus.) S. Skrabe. (Dredge.) T. Trawl. S. Svabere (Swabs.)
				Engl. Favne. (Fathoms.)	Meter. (Metres.)				
1	1876 Juni 3	61° 13'	6° 36' E.	650	1189	6. 6	Sandler.	Sabulous Clay.	S.
2	(June) 3	61 10	6 32 E.	672	1229	6. 7	Sandler.	Sabulous Clay.	T.
4	" 8	61 5	5 14 E.	566	1035	6. 6	Sandler, Grus, Singel.	Sabulous Clay, Pebbles.	T.
8	" 9	61 0	4 49 E.	200	366	6. 6	Ler, Sand, Sten.	Clay, Sand, Stones.	S.
9	" 20	61 30	3 37 E.	206	377	5. 9	Ler.	Clay.	T.
10	" 21	61 41	3 19 E.	220	402	6. 0	Slik, Ler.	Ooze, Clay.	T.
18	" 21	62 44	1 48 E.	412	753	—1. 0	Ler.	Clay.	S. T.
23	" 23	62 52	5 50 E.						T.
25	" 28	63 10	5 25 E.	98	179	6. 9	Sandler.	Sabulous Clay.	T. S.
26	" 28	63 10	5 16 E.	237	433	7. 1	Sandler.	Sabulous Clay.	S.
31	" 29	63 10	5 0 E.	417	763	—1. 0	Sandler.	Sabulous Clay.	S. T.
33	" 30	63 5	3 0 E.	525	960	—1. 1	Ler.	Clay.	T. S.
34	Juli 1	63 5	0 53 E.	587	1073	—1. 0	Ler.	Clay.	T.
35	(July) 5	63 17	1 27 W.	1081	1977	—1. 0	Biloculinler.	Biloculina Clay.	S.
40	" 18	63 22	5 29 W.	1215	2222	—1. 2	Biloculinler.	Biloculina Clay.	S. T.
48	Aug. 6	64 36	10 22 W.	299	547	—0. 3	Mørkegraat Ler.	Dark-grey Clay.	S.
51	" 7	65 53	7 18 W.	1163	2127	—1. 1	Biloculinler.	Biloculina Clay.	S.
52	" 8	65 47	3 7 W.	1861	3403	—1. 2	Biloculinler.	Biloculina Clay.	T.
53	" 10	65 13	0 33 E.	1539	2814	—1. 3	Biloculinler.	Biloculina Clay.	S & T.
54	" 12	64 47	4 24 E.	601	1099	—1. 2	Biloculinler.	Biloculina Clay.	S & T.
60	" 20	64 40	9 30 E.	118	216	7. 0	Haardt Ler.	Hard Clay.	S.
78	" 21	64 48	6 45 E.	155	283	7. 0	Sandler.	Sabulous Clay.	S.
79	" 21	64 48	6 32 E.	155	283	6. 9	Sandler.	Sabulous Clay.	S.
87	" 22	64 2	5 35 E.	498	911	—1. 1	Ler.	Clay.	S.
92	" 22	64 0	6 42 E.	178	326	7. 2	Sandholdigt Ler.	Sabulous Clay.	T.
93	" 24	62 41	7 8 E.	158	289	6. 4	Blødt Ler.	Soft Clay.	T.
(Romsdalsfjord).									
1877									
96	Juni 16	66 8	3 0 E.	805	1472	—1. 1	Biloculinler.	Biloculina Clay.	S.
101	(June) 17	65 36	8 32 E.	223	408	6. 0	Sandler.	Sabulous Clay.	S.
124	" 19	66 41	6 59 E.	350	640	—0. 9	Grovkornet Ler.	Coarse Clay.	S. T.
137	" 21	67 24	8 58 E.	452	827	—1. 0	Ler.	Clay.	S. T.
147	" 22	66 49	12 8 E.	142	260	6. 2	Graat Ler.	Grey Clay.	S.
149	" 23	67 52	13 58 E.	135	247	4. 9	Ler.	Clay.	T. S.
(Vestfjord).									
164	" 29	68 21	10 40 E.	457	836	—0. 7	Sandler.	Sabulous Clay.	S. T.
175	Juli 2	69 17	14 35 E.	415	759	3. 0	Sand, Stene.	Sand, Stones.	S.
176	(July) 3	69 18	14 33 E.	536	980	—0. 2	Ler.	Clay.	S.
177	" 3	69 25	13 49 E.	1443	2639	—1. 2	Biloculinler.	Biloculina Clay.	S & T.
183	" 5	69 59	6 15 E.	1710	3127	—1. 3	Biloculinler.	Biloculina Clay.	S & T.
190	" 7	69 41	15 51 E.	870	1591	—1. 2	Sandholdigt Ler.	Sabulous Clay.	T.
192	" 7	69 46	16 15 E.	649	1187	—0. 7	Sandler.	Sabulous Clay.	S.
195	" 16	70 55	18 38 E.	107	196	5. 1	Sten, Ler.	Stones, Clay.	S.
200	" 17	71 25	15 41 E.	620	1134	—1. 0	Ler.	Clay.	S. T.
205	" 18	70 51	13 3 E.	1287	2354	—1. 2	Biloculinler.	Biloculina Clay.	S.
213	" 26	70 23	2 30 E.	1760	3219	—1. 2	Biloculinler.	Biloculina Clay.	S.
223	Aug. 1	70 54	8 24 W.	70	128	—0. 6	Graasort Sandler.	Dark-grey sabulous Clay	S.
(Jan Mayen).									
224	" 1	70 51	8 20 W.	95	174	—0. 6	Graasort Sandler.	Dark-grey sabulous Clay	S.
225	" 2	70 58	8 4 W.	195	357	—0. 6	Graasort Sandler.	Dark-grey sabulous Clay	S.
226	" 2	70 59	7 51 W.	340	622	—0. 6	Sort Sand og Ler.	Black Sand and Clay.	S.
237	" 3	70 41	10 10 W.	263	481	—0. 3	Brunt Ler, Stene.	Brown Clay, Stones.	S.
240	" 4	69 2	11 26 W.	1004	1836	—1. 1	Biloculinler.	Biloculina Clay.	S.

Station No.	Datum. (Date)	Nordlig Bredde. (North Latitude.)	Længde fra Greenwich. (Longitude.)	Dybde. (Depth.)		Bundens Tempe- ratur. (Temperature at Bottom.) C.	Bunden.	Bottom.	Apparat. (Apparatus) S. Skrabe. (Dredge.) T. Trawl. s. Svabere. (Swabs.)
				Engl. Favne. (Fathoms)	Meter. (Metres.)				
248	Aug. 8	67 56 4 11	E.	778	1423	—1.04	Biloculinler.	Biloculina Clay.	S.
251	" 9	68 6 9 44	E.	634	1159	—1.3	Ler.	Clay.	S.
252	" 11	Vestfjord.					Ler.	Clay.	S.
253	" 15	Skjerstadfjord.		263	481	3.2	Ler.	Clay.	S.
253b	" 17	Saltstrømmen.		90	165		Sten.	Stones.	S.
1878.									
255	Juni 19	68° 12' 15° 40'	E.	341	624	6.5	Ler.	Clay.	S.
(Vestfjord).									
257	(June) 21	70 4 23 2	E.	160	293	3.9	Ler.	Clay.	S.
(Altenfjord).									
258	" 21	70 13 23 3	E.	230	421	4.0	Ler.	Clay.	T.
(Altenfjord)									
260	" 24	70 55 26 11	E.	127	232	3.5	Ler.	Clay.	S. T.
(Porsangerfjord).									
261	" 25	70 47 28 30	E.	127	232	2.8	Ler.	Clay.	S. T.
(Tanafjord).									
262	" 27	70 36 32 35	E.	148	271	1.9	Ler.	Clay.	T. S.
267	" 29	71 42 37 1	E.	148	271	—1.4	Ler, Sten.	Clay, Stones.	S.
270	" 30	72 27 35 1	E.	136	249	—0.0	Ler.	Clay.	S.
273	Juli 1	73 25 31 30	E.	197	360	2.2	Ler.	Clay.	S.
275	(July) 2	74 8 31 12	E.	147	269	—0.4	Ler.	Clay.	T.
280	" 4	74 10 18 51	E.	35	64	1.1	Sten.	Stones.	S.
(Beeren Eiland).									
283	" 5	73 47 14 21	E.	767	1403	—1.4	Ler.	Clay.	S.
286	" 6	72 57 14 32	E.	447	817	—0.8	Ler.	Clay.	T.
290	" 7	72 27 20 51	E.	191	349	3.5	Sandler.	Sabulous Clay.	T.
295	" 14	71 59 11 40	E.	1110	2030	—1.3	Biloculinler.	Biloculina Clay.	T.
297	" 16	72 36 5 12	E.	1280	2341	—1.4	Biloculinler.	Biloculina Clay.	T.
303	" 19	75 12 3 2	E.	1200	2195	—1.6	Biloculinler.	Biloculina Clay.	T.
312	" 22	74 54 14 53	E.	658	1203	—1.2	Ler.	Clay.	T.
315	" 22	74 53 15 55	E.	180	329	2.5	Ler, Sand.	Clay, Sand.	T.
322	" 23	74 57 19 52	E.	21	38	0.2	Haard.	Hard.	S.
323	" 30	72 53 21 51	E.	223	408	1.5	Ler.	Clay.	T.
326	Aug. 3	75 31 17 50	E.	123	225	1.6	Ler.	Clay.	T.
333	" 4	76 6 13 10	E.	748	1368	—1.3	Biloculinler.	Biloculina Clay.	T.
336	" 5	76 19 15 42	E.	70	128	0.4	Ler, Haard B.	Clay, Hard Bottom.	S.
338	" 6	76 16 17 49	E.	146	267	—1.1	Sten.	Rock.	S.
343	" 7	76 34 12 51	E.	743	1359	—1.2	Ler.	Clay.	T.
350	" 8	76 26 0 29	W.	1686	3083	—1.5	Biloculinler.	Biloculina Clay.	T.
353	" 10	77 58 5 10	E.	1333	2438	—1.4	Biloculinler.	Biloculina Clay.	T.
357	" 12	78 3 11 18	E.	125	229	1.9	Ler.	Clay.	S.
359	" 12	78 2 9 25	E.	416	761	0.8	Ler.	Clay.	S.
362	" 14	79 59 5 40	E.	459	839	—1.0	Ler.	Clay.	T.
363	" 14	80 3 8 28	E.	260	475	1.1	Ler.	Clay.	T.
366	" 17	79 35 11 17	E.	61	112	—2.1	Ler.	Clay.	T.
"		Magdalene Bay.		37	68	—0.2			
370	" 18	78 48 8 37	E.	109	199	1.1	Ler.	Clay.	T.
372	" 19	78 9 14 7	E.	129	236	1.2	Ler.	Clay.	T.
(Isfjord).									
374	" 22	78 16 15 33	E.	60	110	0.7	Ler.	Clay.	T.
(Advent Bay).									





# Zoologiske Stationer.

## Zoological Stations.

- Skrabe - Dredge.
- ▽ Trawl.      □ Svabere - Swabs
- Skrabe og Trawl - Dredge & Trawl
- × Mislykket - Failure.









DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

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# BOTANIK.

## PROTOPHYTA:

DIATOMACEÆ, SILICOFLAGELLATA og CILIOFLAGELLATA.

AF

H. H. GRAN.

MED 4 PLANCHER.



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CHRISTIANIA.

GRØNDAHL & SØNS BOGTRYKKERI.

1897.

THE NORWEGIAN NORTH-ATLANTIC EXPEDITION  
1876—1878.

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BOTANY.

PROTOPHYTA:

DIATOMACEÆ, SILICOFLAGELLATA AND CILIOFLAGELLATA.

BY

H. H. GRAN.

WITH 4 PLATES.



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CHRISTIANIA.  
PRINTED BY GRØNDAHL & SØN.  
—  
1897.





Paa den norske Nordhavs-expedition 1876—78 blev der af professor Dr. G. O. Sars indsamlet endel *plankton* fra overfladen; skjönt disse prøver væsentlig indeholder alger, især *Diatomaceer*, har de dog vakt den berømte zoologs interesse, og han har under selve expeditionen udført en række vellykkede tegninger af de mest karakteristiske former. Da jeg sidste vaar fik prøverne til bearbejdelse, var han saa velvillig at laane mig tegningerne til benyttelse.

Prøverne indeholder saagodtsom udelukkende vegetabilsk *plankton*, *Diatomaceer*, *Cilioflagellater* og *Silicoflagellater*; kun paa en enkelt station (296) findes en protozo, *Tintinnus denticulatus*, Ehr., i smaa mængder; jeg vil derfor i dette arbeide kun behandle Nordhavets pelagiske protophytflora.

Der er kun samlet plankton fra et forholdsvis lidet antal stationer; enkelte af prøverne er desuden delvis ødelagte, idet spiritussen er tørret ind; disse har jeg maattet koge med salpetersyre, hvorved cilioflagellaterne destrueres, og alene diatomaceer og silicoflagellater kan undersøges.

Disse prøvers indhold vil derfor kun give et ufuldstændigt billede af Nordhavets planktonflora; men ved senere indsamlinger er de supplerede. Saaledes har Dr. Johan Hjort samlet plankton ved Norges kyster til forskellige aarstider i 1893—95 (kfr. *Hjort*, 1895, p. 38 ff.), cand. real. Nordgaard ved vestkysten fra Stavanger til Lofoten i februar—april 1896 og i Bergensfjorden i juni august s. a., marinekaptein S. Müller ved vestkysten i juni 1896, og paa Dr. Hjorts foranstaltning fulgte kaptein Bie med chefskibet „Heimdal“ paa dets ishavstogt i mai 1896 og samlede plankton paa opturen; i sommeren 1896 har kaptein Haslum i Atlanterhavets nordvestlige del samlet endel prøver, som professor Wille har overladt mig til undersøgelse.

Desuden har dels frk. Kristine Bonnevie, dels jeg selv samlet plankton til forskellige tider i Christianiafjorden, især ved Drøbak, og professor Cleve har velvillig overladt mig en prøve fra Bohuslän (november 1893).

During the Norwegian North Atlantic Expedition, 1876—78, a quantity of *plankton* was collected from the surface by Prof. G. O. Sars. Although these samples contained mainly algæ, especially *Diatomaceæ*, they aroused the interest of that famous zoologist, and even during the expedition, he executed a series of successful drawings of the most characteristic forms. When I received the samples, in the spring of 1896, for investigation, Prof. Sars was kind enough to place his drawings at my disposal.

The samples contain almost exclusively vegetable *plankton*, *Diatomaceæ*, *Cilioflagellata* and *Silicoflagellata*; at only one station (296) was a protozoon found, — *Tintinnus denticulatus*, Ehr. — in small quantities. In this paper I will therefore only treat of the pelagic protophytic flora of the North Atlantic.

Plankton was collected at only a comparatively small number of stations. A few of the samples, moreover, were partially destroyed through the drying up of the alcohol, and these I was obliged to boil in nitric acid, thereby destroying the *Cilioflagellata*; so that only the *Diatomaceæ* and *Silicoflagellata* could be examined.

The contents of the samples will therefore give only an incomplete representation of the plankton flora of the North Atlantic; but it is supplemented by subsequent collections. Dr. Joh. Hjort collected plankton on the coasts of Norway at different seasons of the year, during the years 1893—95 (cf. *Hjort*, 1895, p. 38, etc.); Mr. Nordgaard on the west coast from Stavanger to Lofoten in February, March and April, 1896, and in the Bergen Fjord in June, July and August of the same year; Capt. S. Müller, R. N. on the west coast in June, 1896; and by Dr. Hjort's directions, Capt. Bie accompanied the ship „Heimdal“ on her arctic cruise in May, 1896, and collected plankton on the outward voyage; and in the summer of 1896, Capt. Haslum collected some samples from the north-western parts of the Atlantic, which Prof. Wille has handed over to me for examination.

In addition to these, Miss Kristine Bonnevie and I have each collected plankton at various times from the Christiania Fjord, especially at Drøbak; and Prof. Cleve has kindly sent me a sample from Bohuslän (Nov. 1893).

Alle disse planktonprøver har jeg undersøgt paa *Cilioflagellater* og *Diatomaceer*; paa dette grundlag vilde der derfor kunne gives en udvidet fortegnelse over planktonfloraen i Nordhavet og ved Norges kyster. Men selv en saadan fortegnelse maatte blive provisorisk; da undersøgelserne fremdeles fortsættes, har jeg derfor ved denne anledning ikke fundet det heldigt at give nogen samlet fortegnelse over alle hidtil fundne arter. Derimod har jeg her indskrænket mig til dels at behandle Nordhavsexpeditionens materiale, dels at give en kritisk oversigt over enkelte af de biologisk vigtigste slechter af pelagiske diatomaceer. For disse slekters vedkommende har jeg da medtaget alle de arter, som jeg har kunnet paavise ved vore kyster.

Ved en anden anledning vil jeg saa meddele resultatet af de øvrige undersøgelser og de slutninger, som jeg i samarbejde med Dr. *Johan Hjort* og cand. real. *Nordgaard* har kunnet drage om planktonalgernes biologiske forhold og deres afhængighed af havstrømmene.

Fra Nordhavs-expeditionen har jeg kun kunnet undersøge planktonprøver fra 13 forskellige stationer; paa to af disse prøver var etiketten ulæselig, da blækket var falmet; fem andre var indtørkede, saa at de for undersøgelsen maatte koges med syre; derved blev de mulig tilstedeværende cilioflagellater ødelagte.

Nedenstaaende tabel giver en oversigt over prøvernes indhold af *Diatomaceer*, *Silicoflagellater* og *Cilioflagellater*; stationerne er opførte i kronologisk orden, de to usikre tilslut under merkerne *A* og *B*. For hver station er anført efter *Mohn* (1887) og *Tornøe* (1880) bredde, længde samt saavidt muligt temperatur og saltgehalt i overfladen og i en dybde, som er angiven i meter under rubrikken „dybde“.

I rubrikkerne for de forskellige arter betegner *c*, at vedkommende art forekommer almindelig, *cc* meget almindelig, *r* sparsomt, *+* temmelig hyppig. En saadan betegnelsesmaade er for vegetabilsk plankton først benyttet af *Cleve* (1894).

Som tabellen viser, er indholdet af de forskellige prøver i det store og hele temmelig ensartet, og antallet af arter er meget lidet i forhold til individantallet. Denne ensformighed synes at være karakteristisk for oceanets plankton, medens planktonet i de grundere kystbassiner til visse aarstider ofte kan indeholde et meget større antal arter i varieret blanding. Paa den anden side synes det ogsaa at være en regel, at ensformigheden tiltager med voksende bredde.

De arter, som danner hovedmassen, er alle tidligere kjendte som karakterformer i det nordlige Atlanterhav.\*) Fælles for alle stationer er *Thalassiothrix longissima*; denne alge findes udbredt over hele det nordlige Atlanterhav og kan undertiden følge det atlantiske vand ind til Norges

In all these samples I have made investigations of *Cilioflagellata* and *Diatomaceæ*; and upon this basis an enlarged list of the plankton flora of the North Atlantic, and the Norwegian coasts might therefore be given. Even a list of this kind, however, could only be provisional; and as investigations are still being carried on, I have not, on the present occasion, considered it advisable to give any complete list of all the hitherto discovered species. I have, on the contrary, confined myself partly to the treatment of the N. Atlantic Expedition material, and partly to giving a critical survey of a few of the biologically most important genera of pelagic *Diatomaceæ*. As regards these genera, I have included all the species that I could demonstrate as belonging to our (the Norwegian) coasts.

On some future occasion, I will impart the results of the remaining investigations, and the conclusions to which, in collaboration with Dr. *Johan Hjort* and Mr. *Nordgaard*, I have come concerning the biological conditions of the plankton algæ, and their dependence on ocean currents.

I have been able to examine plankton samples from only 13 different stations of the N. Atlantic Expedition. The label on two of these samples was illegible, the ink having faded; 5 others had dried up, and had to be boiled in acid before investigation, thereby causing the destruction of any *Cilioflagellata* that might possibly have been present.

The subjoined table gives a survey of the *Diatomaceæ*, *Silicoflagellata* and *Cilioflagellata* contained in the samples. The stations are placed in chronological order, the two uncertain ones last, marked *A* and *B*. The latitude, longitude and, as far as possible, the temperature and saltness at the surface and at a depth given in metres in the division „Depth“, are given for every station according to *Mohn* (1887) and *Tornøe* (1880).

In the divisions for the various species, *c* indicates that the species referred to is of common occurrence, *cc* very common, *r*, scarce, *+*, rather frequent. This mode of describing vegetable plankton was first employed by *Cleve* (1894).

As the table shows, there is, on the whole, rather a sameness about the contents of the various samples; and the number of species is very small in comparison with the number of specimens. This sameness appears to be characteristic of the ocean plankton, while that of the shallower coast basins can often, at certain seasons, contain a much larger number of species in a variety of combinations. On the other hand, it also appears to be a rule that uniformity increases with the increase of latitude.

The great bulk of the species are all already known as characteristic forms of the North Atlantic Ocean.\*) *Thalassiothrix longissima* is common to all stations; this alga is found all over the N. Atlantic Ocean, and occasionally accompanies the water of the Atlantic up to the

\*) Alle prøver tilhører *Cleves* type III, *Trichoplankton* (1896, 5) p. 6.

\*) The samples all belong to *Cleve's* type III, *Trichoplankton* (1896 5) p. 6.



kyster, lige til Christianiafjorden. Med voksende bredde synes den at tiltage i individantal, medens de øvrige arter træder mere tilbage; det er derfor forsaavidt korrekt, naar *Sars* paa en af sine tegninger har noteret ved denne art: „karakteristisk for polarvandet“. Den findes ogsaa i havstrømme af utvilsom arktisk oprindelse (f. eks. st. 354 og 358), men dog i størst mængde i det saltrige, atlantiske vand (saltgehalt 35‰ eller derover), eller hvor saadant findes i nærheden.

coasts of Norway as far as the Christiania Fjord. With an increase of latitude, it appears to increase in numbers, while the other species decrease; it is thus to a certain extent correct when *Sars*, on one of his drawings, makes the note regarding this species: „characteristic of the polar waters“. It is also found in ocean currents that are of undoubted arctic origin (e. g. Stations 354 and 358), but in greatest numbers in the strongly saline water of the Atlantic (saltness, 35‰ or more) or in its neighbourhood.

Station Nr. (No. of Station.)	273		296		297		303		306	312	331	345	354	358	362		A	B
N. Bredde (N. Lat.)	73° 25'		72° 15'		72° 36'		75° 12'		75° 0'	74° 54'	75° 51'	76° 42'	78° 1'	78° 2'	79° 59'			
O. Længde (E. Greenw.) (E. Long. (E. Greenw.))	31° 30'		8° 9'		5° 12'		3° 2'		10° 27'	14° 53'	13° 5'	10° 9'	6° 54'	9° 46'	5° 40'			
Dybde i m. (Depth in m.)	0	360	0	183	0	0	274	0	0	0	0	0	0	0	0	839		
Temperatur C.° (Temperature, C.)	4.9	2.2	6.3	3.1	4.6	3.2	÷1.1	5.4	6.0	6.8	5.1	4.5	4.3	5.2	÷1.0			
Saltgehalt (Saltness)	3.51	3.51		3.51	3.49	3.46	3.49	3.49		3.50					3.47	3.48		
<i>Thalassiothrix longissima</i> , Cl. & Grun	r		c		cc	cc		c	c	cc	cc	+	+	c		+	c	
<i>Nitzschia longissima</i> (Bréb.) Ralfs											r	r						
<i>Fragilaria oceanica</i> , Cl. . . . .											r	r						
<i>Rhizosolenia alata</i> , Brightw. . . . .			+					+	r		r					r	+	
— <i>semispina</i> , Hensen . . . . .			c		+				r							r		
— <i>styliiformis</i> , Brightw. . . . .			r					r	r					r		+		
<i>Chaetoceros atlanticum</i> , Cl. . . . .			r		+			+	+	+	r					+		
— <i>boreale</i> , Bail. . . . .	+		c		+			+	+	+	r		r	+		c	r	
— <i>Brightwellii</i> , Cl. . . . .	+		+		+			+	+	+	r	r		+		c	r	
— <i>decipiens</i> , Cl. . . . .	+		r		+			r	r	r	r	r					+	
— <i>debile</i> , Cl. . . . .			+															
— <i>furcellatum</i> , Bail. . . . .											+	c		+			cc	
<i>Melosira solida</i> , Eul. . . . .					r	r		r			r		+	r				
<i>Thalassiosira gravida</i> , Cl. . . . .	+		r		r						r	r		r				
— <i>Nordenskiöldii</i> , Cl. . . . .					r						r	r		r			+	
<i>Asteromphalus atlanticus</i> , Cl. . . . .					r					r	r						r	
<i>Distephanus speculum</i> , Ehr. . . . .										r	r	r		r			r	
<i>Ceratium tripos</i> v. <i>labradorica</i> , Schütt			r										r					
— — <i>r. tergestina</i> , Schütt			r		*)	*)		*)	r		*)		*)					
— <i>fusus</i> (Ehr.) Duj. . . . .			r															

Endnu mere udpræget atlantiske er de grovere *Chaetoceros*-arter (*Ch. atlanticum*, *boreale*, *Brightwellii* og *decipiens*) og endvidere de i tabellen opførte arter af slekten *Rhizosolenia*, specielt *Rh. semispina* og *styliiformis*. Det vil sees af tabellen, at disse arter fortrinsvis følger det saltrigste vand og den høieste temperatur (st. 296, 312, 331).

Alle disse er ægte pelagiske former, som sandsynligvis vegeterer hele aaret igennem og sjelden eller aldrig danner hvileporer. Saadanne er ialfald endnu ikke paaviste hos nogen af dem, og det er heller ikke sandsynligt, at hvileporerne, om de existerer, kan have nogen væsentlig betydning i disse arters livscyklus. Paa de store dyb i oceanet vilde nemlig hvileporerne efter al sandsynlighed gaa tilgrunde, idet de ikke vilde kunne komme op til overfladen igjen, naar de først havde sunket ned til en vis dybde.

\*) For stationerne 297, 303, 306, 345, 358 er ikke undersøgt paa cilioflagellater paa grund af materialets indtørring.

Still more markedly Atlantic are the larger species of *Chaetoceros* (*Ch. atlanticum*, *boreale*, *Brightwellii* and *decipiens*), and also those species of the genus *Rhizosolenia*, given in the table, especially *Rh. semispina* and *styliiformis*. It will be seen from the table, that these species are more especially found in the more strongly saline water and the highest temperature (Stations 296, 312, 331).

All these are true pelagic forms, which probably vegetate all the year through, and seldom, if ever, form spores (endocysts); at any rate, the existence of such has never yet been proved in any of them. Nor is it likely that, if they do exist, they can have any essential importance in the course of existence of these species; for in great ocean depths, they would in all probability go to the bottom, being unable to rise to the surface again after once sinking to a certain depth.

\*) In the case of Stations 297, 303, 306, 345 and 358, Cilioflagellata were not examined, on account of the drying up of the material.

Alle de ovenfor nævnte diatomaceer kan man derfor med *Hüeckel* (1890) betegne som *holoplanktoniske* organismer.

I modsætning til disse arter staar en række af andre former, som under visse forhold danner hvilesporer, der synker tilbunds, men sandsynligvis igjen spirer, naar gunstige forhold indtræder. Disse arter kan kaldes *meroplanktoniske* organismer; de har en hvileperiode, da de næsten eller helt forsvinder fra planktonet, og en vegetationsperiode, i hvilken de udvikler sig raskt og ofte optræder i enorme mængder.

Endnu er det ikke undersøgt, hvilke ydre forhold det er, som fremkalder dannelsen af hvilesporer, og hvilesporerens spiring er ikke iagttaget hos nogen af arterne. Det er sandsynligt, at periodernes veksling ikke alene er afhængig af årstiderne, men at den vil vise sig forskjellig fra sted til sted og fra det ene aar til det andet; af de hidtil vundne resultater (*Schütt* 1888, *Engler* 1883) synes det at fremgaa, at vegetationsperioden er kort i forhold til hvileperioden.

I Nordhavs-expeditionens materiale findes 5 arter, hos hvilke hvilesporer kjendes, nemlig *Chaetoceros debile* og *furcellatum*, *Thalassiosira gravis* og *Nordensköldii*, *Fragilaria oceanica*. Af disse er *Chaetoceros debile* en atlantisk form, som kun forekommer paa station 296; de øvrige 4 findes fortrinsvis paa de rent arktiske stationer (345, 354, 362). *Chaetoceros furcellatum* og *Fragilaria oceanica* er ogsaa hidtil kun fundne paa høie nordlige bredder; *Thalassiosira* arterne har en videre udbredelse, men har paa lavere bredder sin vegetationsperiode især om vinteren.

Cilioflagellaterne og Silicoflagellaterne forekommer i saa ringe mængde, at de ikke har nogen væsentlig betydning for planktonets karakteristik.

Skjønt Nordhavs-expeditionens planktonmateriale er temmelig sparsomt, kan det altsaa dog give endel almindelige resultater, som kan sammenfattes paa følgende maade.

Det atlantiske vand karakteriseres især ved de holoplanktoniske arter *Chaetoceros decipiens*, *atlanticum*, *boreale* og *Brightwellii* samt *Rhizosolenia*-arterne, polarvandet om sommeren ved de meroplanktoniske arter *Chaetoceros furcellatum*, *Fragilaria oceanica* og *Thalassiosira*-arterne. Fælles for alle prøver er *Thalassiothrix longissima*.

Men grænsen kan efter disse prøvers indhold ikke trækkes bestemt, enten fordi havstrømmene til en vis grad blander sig med hverandre, eller fordi diatomaceerne har en evne til at stige eller synke fra det ene vandlag til det andet uafhængig af strømmene. Ved andre anledninger har jeg fundet kjendsgjæringer, som bestemt tyder paa, at dette sidste kan finde sted.

All the above-named Diatomaceæ I can therefore, in common with *Haeckel* (1890), designate as *holoplanktonic* organisms.

As opposed to these species, there is a series of other forms which, under certain circumstances, form spores which sink to the bottom, but probably germinate again under more favorable conditions. These species may be called *meroplanktonic* organisms; they have a period of rest, during which they almost entirely disappear from the plankton, and a period of vegetation, during which they develop rapidly, and often appear in great numbers.

Investigations have not yet been made to ascertain the external conditions which occasion the formation of spores, and their germination has not been observed in any of the species. It is probable that the change of periods is not only dependent upon the time of year, but that it will prove to be different in different localities and different years. It appears from the results hitherto gained (*Schütt*, 1888, *Engler*, 1883), that the vegetation period is short in comparison to the period of rest.

There are 5 species among the N. Atlantic Expedition material, in which spores are found, viz. *Chaetoceros debile* and *furcellatum*, *Thalassiosira gravis* and *Nordensköldii*, *Fragilaria oceanica*. Of these, *Chaetoceros debile* is an Atlantic form, occurring only at Station 296; the other 4 are principally found at the truly arctic stations (345, 354, 362). *Chaetoceros furcellatum* and *Fragilaria oceanica* have also hitherto only been found in high northern latitudes; the *Thalassiosira* species have a wider distribution, but in lower latitudes have their vegetation period especially in the winter.

Cilioflagellata and Silicoflagellata occur in such small numbers, that they do not greatly affect the character of the plankton.

Thus although the N. Atlantic Expedition's plankton material is rather meagre, it may yet give certain general results, which can be summed up in the following manner.

The water of the Atlantic is especially characterized by the holoplanktonic species *Chaetoceros decipiens*, *atlanticum*, *boreale* and *Brightwellii*, and by the *Rhizosolenia* species; the water of the polar sea during summer, by the meroplanktonic species *Chaetoceros furcellatum*, *Fragilaria oceanica* and the *Thalassiosira* species. *Thalassiothrix longissima* is common to all the samples.

From the contents of these samples, however, no decided boundary can be drawn, either because the ocean currents mix to a certain extent with one another, or because the Diatomaceæ have the power of rising or sinking from one stratum of water to another, independently of the currents. On other occasions, I have found facts which clearly point to the occurrence of the last-named possibility.

## Diatomaceæ.

### Thalassiothrix, Cl. et Grun.

**Th. longissima**, Cl. et Grun. (1880) p. 108.

Syn. *Synedra Thalassiothrix*, Cl. (1873, 13) p. 22, T. IV, fig. 22.  
— — —, Schütt (1893) p. 18, fig. 4, p. 21, fig. 11.

Forekommer i alle Nordhavs-expeditionens prøver. Kommer ind til Norges kyst især vinter og vaar, men ogsaa til andre aarstider, med atlantisk vand.

*Udbredelse.* Atlanterhavet—Ishavet.

### Nitschia, W. Sm.

**N. longissima**, (Bréb.) Ralfs.

— — — Cl. et Grun. (1880) p. 100.

Syn. *Nitschiella longissima*, Van Heurck. Synopsis T. 70, fig. 2.

Ifølge *Sars's* tegninger er denne art funden paa Nordhavs-expeditionen st. 345, sparsomt. Selv har jeg seet den i prøver fra Lofoten (marts—april 1896, *Nordgaard*).

*Udbredelse.* Atlanterhavet—Ishavet.

### Fragilaria, Lyngb.

**F. oceanica**, Cl. (1873, 13) p. 22, T. IV, fig. 25.

Grun. (1884) T. II, fig. 14.

Syn. *F. arctica*, Grun. in Cl. et Grun. (1880) p. 110, T. VII, fig. 124.

Filamentets bredde varierer fra 7—39  $\mu$ . De „indre celler“, som *Cleve* afbilder og omtaler (l. c. 1873), er ganske vist hvilesporer; jeg har ogsaa selv iagttaget dem i flere af mine præparater fra Ishavet og fra Lofotens kyst.

*Forekomst.* Nordhavs-expeditionen st. 345, 354. Lofoten marts—april 1896 (*Nordgaard*) med *Phæocystis Pou-*

## Diatomaceæ.

### Thalassiothrix, Cl. et Grun.

**Th. longissima**, Cl. et Grun. (1880) p. 108.

Syn. *Synedra Thalassiothrix*, Cl. (1873, 13) p. 22, Pl. IV, fig. 22.  
— — —, Schütt (1893) p. 18, fig. 4, p. 21, fig. 11.

\* Occurs in all the N. Atlantic Expedition samples. Comes in to the shores of Norway especially in winter and spring, but also at other times, with Atlantic water.

*Distribution.* Atlantic Ocean, Arctic Ocean.

### Nitschia, W. Sm.

**N. longissima**, (Bréb.) Ralfs.

— — — Cl. et Grun. (1880) p. 100.

Syn. *Nitschiella longissima*, Van Heurck. Synopsis T. 70, fig. 2

According to *Sars's* drawings, this species was found at Station 345 of the N. Atlantic Expedition, in small numbers. I myself have seen it in samples from Lofoten (March and April, 1896, *Nordgaard*).

*Distribution.* Atlantic Ocean, Arctic Ocean.

### Fragilaria, Lyngb.

**F. oceanica**, Cl. (1873, 13) p. 22, Pl. IV, fig. 25.

Grun. (1884) Pl. II, fig. 14.

Syn. *F. arctica*, Grun. in Cl. et Grun. (1880) p. 110, Pl. VII, fig. 124.

The width of the filaments varies from 7 to 39  $\mu$ . The „interior cells“, which *Cleve* figures and describes, (l. c. 1873), are without doubt spores. I too, have observed them in several of my preparations from the Arctic Ocean and the coast of Lofoten.

*Occurrence.* N. Atlantic Expedition Stations 345, 354; Lofoten, March and April, 1896 (*Nordgaard*), with



*cheti* (Har.) Lagerh.; N. Atlanterhav, 66° N. br., 30<sup>1</sup>/<sub>2</sub>° L. W. (Haslum) med *Thalassiosira*-arter.

*Udbredelse.* Ishavet—N. Atlanterhav.

### **Rhizosolenia, Ehr.**

**Rh. alata**, Brightw. (1858) T. V, fig. 8. Peragallo (1892) p. 115, T. V, fig. 11.

var. **truncata**, n. var. T. IV, fig. 67, *a—c*.

Adskiller sig fra hovedformen og fra var. *gracillima*, Cl. ved en kortere kalyptra med kegleformet, ret, bred, tvært afskaaren spids. Diameter 5—13  $\mu$ .

*Forekomst.* Nordhavs-expeditionens st. 296, 312 etc. N. Atlanterhav mai 1896 (*Bie*).

*Udbredelse.* Hovedarten i alle have, var. *truncata* i N. Atlant., var. *gracillima* Cl. i Østersøen—Nordsøen.

**Rh. semispina**, Hensen (1887) p. 84, T. V, fig. 39.

Fig. Schütt (1893) p. 21, fig. 9.

Diameter 4.5—12.5  $\mu$ .

*Forekomst.* Nordhavs-expeditionens st. 296, 297, 331, Vestkysten juni—juli 1895 (*Hjort*), februar 1896 (*Nordgaard*), Drøbak februar 1896, N. Atlanterhav mai 1896 (*Bie*).

*Udbredelse.* N. Atlanterhav—V. Østersøen.

**Rh. styliformis**, Brightw. (1858) T. V, fig. 5. Peragallo (1892) p. 111, T. IV, fig. 1—5.

*Udbredelse.* Atlanterhavet—Østersøen.

### **Chætoceros, Ehr.**

Arter af slegten *Chætoceros* forekommer til sine tider i store mængder i havet ved vore kyster, hvor de ofte danner hovedmassen af planktonet. Men det har hidtil været forbundet med vanskeligheder at studere dem, da arternes systematiske forhold endnu ikke paa langt nær er udredede. Derfor har jeg fundet det heldigst her at give en samlet beskrivelse af alle de arter, som jeg har fundet ved vore kyster.

De ældre forskere, som har undersøgt diatomaceer, har saagodtsom udelukkende undersøgt det glødede kiselpanser enten tort eller indesluttet i forskellige sterkt lysbrydende medier; derved har man opnaaet at adskille fine strukturforhold i cellevæggen. Disse metoder er vistnok fremdeles nødvendige for alle diatomaceer; men for *Chætoceros*-arterne er de ikke tilstrækkelige.

*Phæocystis Poucheti* (Har.) Lagerh.; N. Atlantic Ocean, 66° N. Lat. 30<sup>1</sup>/<sub>2</sub>° W. Long. (Haslum), with species of *Thalassiosira*.

*Distribution.* Arctic Ocean, N. Atlantic Ocean.

### **Rhizosolenia, Ehr.**

**Rh. alata**, Brightw. (1858) Pl. V, fig. 8. Peragallo (1892), p. 115, Pl. V, fig. 11.

var. **truncata**, n. var. Pl. IV, fig. 67, *a—c*.

Is distinguishable from the chief form, and from var. *gracillima*, Cl. by a shorter calyptra, with a straight, broad, abruptly-truncated point. Diameter 5—13  $\mu$ .

*Occurrence.* N. Atlantic Expedition Stations 296, 312, etc.; N. Atlantic Ocean, May, 1896 (*Bie*).

*Distribution.* The chief species in all seas, var. *truncata*, N. Atlantic, var. *gracillima*, Cl., Baltic and North Sea.

**Rh. semispina**, Hensen (1887) p. 84, Pl. V, fig. 39.

Fig. Schütt (1893) p. 21, fig. 9.

Diameter, 4.5—12.5  $\mu$ .

*Occurrence.* N. Atlantic Expedition Stations 296, 297, 331; west coast of Norway, June and July, 1895, (*Hjort*), February, 1896 (*Nordgaard*); Drøbak, February, 1896; N. Atlantic, May, 1896 (*Bie*).

*Distribution.* N. Atlantic, West Baltic.

**Rh. styliformis**, Brightw. (1858) Pl. V, fig. 5. Peragallo (1892) p. 111; Pl. IV, figs. 1—5.

*Distribution.* Atlantic, Baltic.

### **Chætoceros, Ehr.**

Species of the genus *Chætoceros* occur at times in great numbers in the sea round our (the Norw.) coasts, where they often make up the great bulk of the plankton; but their study has hitherto been attended with difficulty, as the systematic conditions of the species are still far from being made clear. I have therefore thought it best to give here a collective description of all the species that I have found on our (the Norw.) shores.

Earlier naturalists, who have studied Diatomaceæ, have examined almost exclusively the siliceous cell walls which remain after exposure to the action of fire, either dry, or enclosed in various strongly refractive media, and have thereby succeeded in distinguishing delicate structural conditions in the cell walls. These methods, it is true, are still necessary for all Diatomaceæ, but are not sufficient for the *Chætoceros* species.

Paa den ene side er der mange arter, hvis kiselpanser er saa tyndt, at det falder sammen og bliver ukjendeligt ved indtørring, og selv paa de grovere arter kan cellevæggen lide formforandringer, saa at karakteristiske forhold undgaar opmærksomheden. Paa den anden side mister man derved anledningen til at iagttage celleindholdet; dette giver meget gode systematiske karakterer, som det er paavist af *Pfitzer* (1871) og *Schütt* (1888, 1895).

Naar algerne straks ved indsamlingen konserveres i sterk alkohol, fikses baade kromatoforer og cellekjerne; de bør da helst farves f. eks. med safranin, som gjør meget god tjeneste og er let at behandle, og undersøges i vand. Med denne methode kan man naa længere end med nogen anden hidtil anvendt; arterne har da et saa karakteristisk udseende ved sin ydre form og sit celleindhold, at de kan gjenkjendes selv ved temmelig svage forstørrelser.

Kun naar man skal undersøge hornenes eller hvilesporernes struktur eller cellerne i sidestilling, kan det være nødvendigt at benytte glødningsmetoden eller kemisk behandling.

*Chatoceros*-arternes cellevæg bestaar af to *skaller* (*valvæ*) og et *baand* (tysk gürtelband); kun under auxospore-dannelsen har cellen to baand, et fæstet til hver af skallerne. *Baandet* eller den forbindende membran har form af en kortere eller længere aaben cylinder. Det er ved *sømmene* (*suturæ*) forbundet med skallenes cylindriske del, *skalkappen*. Ved *sømmene* er cellevæggen oftest noget indsnævret, undertiden temmelig sterkt (f. eks. hos *Chatoceros constrictum* n. sp.). Skallernes bund har form af en mere eller mindre langstrakt ellipse, som kan være hvælvet eller konkav. Nær enderne af ellipsens længste axe er *hornene* fæstede. Ellipsens længste axe kalder jeg med *Schütt* (1895) *sagittalaxen* (*s*), den korte axe *transversalaxen* (*t*). Den tredje axe, som gaar fra midten af den ene skal til midten af den anden, kaldes *longitudinalaxen* (*l*).\*) Det plan, som kan lægges gennem denne og sagittalaxen, kaldes *sagittalplanet*.

Cellen siges at ligge i *frontstilling*\*\*), naar baandets bredeste side er vendt mod iagttageren (breite Gürtelbandansicht). Naar skallens flade sees, kaldes det *sidestilling* (Schalenansicht), og naar baandets smaleste side sees, *sagittalstilling* (schmale Gürtelbandansicht).

Hornene udgaar et fra hvert af cellens 4 hjørner (cellen tænkes i frontstilling); de binder cellerne sammen i

\*) Otto Müller (1895) har for diatomaceernes axer indført andre navne, *s* = apikalaxen, *t* = transapikalaxen, *l* = perivalvaraxen. Da *Cleve* har benyttet *Schütt*'s betegnelser, har jeg ogsaa troet at burde følge dem.

\*\*) *Schütt* afviger her fra de ældre (engelske) forfattere; jeg har ment at burde følge disse i nomenklaturen, selv om *Schütt*'s betegnelser i og for sig synes mig mere hensigtsmæssige.

There are, on the one hand, many species whose siliceous envelope is so thin that it collapses and becomes unrecognizable after drying, and even in the coarser species, the cell wall may undergo changes of form, so that the characteristic conditions escape notice. On the other hand, the opportunity is thereby lost of observing the contents of the cell, which exhibit very good systematic characters, as demonstrated by *Pfitzer* (1871) and *Schütt* (1888, 1895).

When the algæ, immediately after collection, are preserved in alcohol, both the chromatophores and the cell-nucleus are fixed, and should then be stained (e. g. with safranin, which answers the purpose very well, and is easy to manipulate), and examined in water. By this method we are enabled to get farther than by any other hitherto employed; the external form and cellular contents of the species are then so characteristic in appearance, that they are recognisable even under a tolerably weak magnifying power.

Only when the structure of the setæ or the spores, or a side view of the cells is to be examined, may it be necessary to expose to the action of fire or to boil with acids.

The cell wall of the *Chatoceros* species consists of two *valves* (*valvæ*) and a *hoop* (German, Gürtelband). During the formation of the auxospores the cell has two hoops, one connected to each of the valves. The *hoop*, or connecting membrane has the shape of shorter or longer open cylinder. At the *sutures* (*suturæ*), it is connected with the cylindrical portion of the valves, the mantle. At the sutures, the cell wall is often narrowed, sometimes very considerably (e. g. in *Chatoceros constrictum* n. sp.). The bottom of the valves has the form of a more or less elongated ellipse, which may be convex or concave. The setæ are attached near the extremities of the long axis of the ellipse. In common with *Schütt* (1895), I call the long axis of the ellipse the *sagittal axis* (*s*), and the short axis, the *transverse axis* (*t*); the third axis, which goes from the middle of one valve to the middle of the other, is called the *longitudinal axis*\*). The plane which may be made to pass through this and the sagittal axis, is called the *sagittal plane*.

That view in which the broadest side of the hoop is turned towards the observer is termed the *front view*\*\*) of the cell (breite Gürtelbandansicht). When the surface of the valve is seen, it is called the *side view* (Schalenansicht); and when the narrowest side of the hoop is seen, the *sagittal view* (schmale Gürtelbandansicht).

The setæ issue one from each of the four angles of the cell (the front view of the cell is the one here sup-

\*) Otto Müller (1895) has given other names to the axes of the Diatomaceæ: *s* = apical axis, *t* = transapical axis, *l* = perivalvar axis. As *Cleve* employs *Schütt*'s terminology, I have considered it right to do the same.

) *Schütt* here differs from the earlier (English) writers, I have considered it right to follow the latter in their nomenclature, even though *Schütt*'s designations in themselves may be more convenient.



kjeder; mellem cellerne findes aabninger, *foramina*, der kan have forskellig form. Hornene fra de tilstødende hjørner er sammenvoksede ved udgangspunktet eller noget udenfor dette; sjelden er de ikke direkte sammenvoksede, men forbundne ved en fin kiseltraad (*Ch. externum* n. sp.). Fra sammenvoksningspunktet gaar de oftest tværs paa længdeaxen og danner i almindelighed omtrent en ret vinkel med hinanden indbyrdes. Desuden kan de hos nogle arter være boiede paa forskellig maade; i almindelighed er de noget afboiede mod længdeaxen i retning af filamentets nærmeste ende. Den yderste celle i kjeden bærer ofte horn, som i retning og form afviger fra de øvrige, *terminalhornene*; de kan være forsynede med eiendommelige spiralstillede forhøininger, som har været benyttet til at karakterisere arterne. Disse forhøininger er dog ikke altid udpræget tilstede; især om sommeren er de ofte meget utydelige, ligesom ogsaa da cellevæggene er tyndere, *foramina* større og hornene spædere end om vinteren (se f. eks. T. III, fig. 37, *Ch. didymum* f. *aestiva*).

Celledelingen hos *Chaetoceros* er beskrevet af Schütt (1888); som Pfitzer har paavist, bliver ved diatomaceernes celledeling cellerne altid mindre og mindre, saa at der med logisk nødvendighed maa forudsættes en *auxosporedannelse*. Denne foregaar hos *Chaetoceros*-arterne paa kjønslos vei; den er beskrevet af Schütt (1889) for *Ch. curvisetum* Cl. og en anden art fra Østersøen. Selv har jeg iagttaget den hos flere arter: *Ch. constrictum* n. sp., *Ch. diadema* (Ehr.), *Ch. debile* Cl., *Ch. teres* Cl.; den foregaar hos disse omtrent paa samme maade som hos *Ch. curvisetum*.

*Hvilesporer* har hidtil været kjendt kun for et forholdsvis lidet antal former; det har lykkedes mig at paavise dem hos de fleste arter af underslegten *Hyalochæte*; som det vil sees af det følgende, har de store systematisk (og biologisk) betydning.

Hvilesporerens væg bestaar af to temmelig tykke, ofte bevæbnede skaller, som kan være temmelig forskellige. Den, som dannes først (*primærskallen* eller den øvre skal, *epitheka*), er oftest høiere hvælvet end *sekundærskallen*, *hypotheka*, der slutter ind i den første. Primærskallen har et cylindrisk parti, som slutter tæt ind til modercellens baand og hos enkelte arter vokser sammen med dette. Modercellens baand bliver isaafald fortykket og danner en cylindrisk kappe paa sporens øvre side (*Ch. curvisetum* Cl., *Ch. contortum*, Schütt).

Sporen ligger enten midt i modercellen (*Ch. Schüttii* Cl. m. fl.) eller ensidig, nærmere ved den ene skal end ved den anden (*Ch. lacinosum* Schütt m. fl.); i sidste tilfælde vender den altid undersiden (sekundærskallen) mod modercellens nærmeste skal. Ensidigheden kan gaa saa vidt, at undersiden berører modercellens skal og vokser sammen med denne; i dette tilfælde bærer sporemodercellerne eiendommelige horn, ved hvilke sporerne fæstes parvis

posed); they connect the cells in chains or *filaments*. Between the cells there are openings, *foramina*, which may be of various shapes. The setæ from adjacent angles are coalesced at their starting-point or somewhat beyond it; sometimes, but not often, they are not directly coalesced, but are connected by a fine siliceous thread (*Ch. externum* n. sp.). From the point of coalescence, they most frequently run transversely to the long axis, and generally form almost a right angle with one another. They are, moreover, bent in various ways, generally somewhat deflected towards the long axis, in the direction of the nearest extremity of the filament. The outermost cell in the chain often carries setæ called terminal setæ, which, in direction and shape, differ from the others; they may often be furnished with peculiar, spiral prominences, which have been employed to characterise the species. These prominences, however, are not always present in any marked degree; in summer especially, they are often very indistinct, the cell walls also at that time being thinner, the *foramina* larger, and the setæ more slender than during the winter (see c. g. Pl. III, fig. 37, *Ch. didymum* f. *aestiva*).

The cell-division in *Chaetoceros* has been described by Schütt (1888). As Pfitzer has demonstrated, the cells, in the cell-division of the Diatomaceæ, continually become smaller and smaller, so that there is a logical necessity for presupposing an auxospore-formation. In the *Chaetoceros* species it takes place asexually: it is described by Schütt (1889) in the case of *Ch. curvisetum* Cl. and another species from the Baltic. I myself have observed it in several species, — *Ch. constrictum* n. sp., *Ch. diadema* (Ehr.), *Ch. debile* Cl. and *Ch. teres* Cl.; it takes place in these species in the same way as in *Ch. curvisetum*.

*Spores* have hitherto only been known in a comparatively small number of forms; but I have succeeded in tracing them in most species of the sub-genus *Hyalochæte*. It will be seen from the following that they are of great systematic and biological importance.

The wall of the spores consists of two fairly thick, often armed valves, which may differ considerably. The one which is first formed (the *primary* or *upper* valve, *epitheka*) is often more vaulted than the *secondary* valve (*hypotheka*), which fits into the former. The primary valve has a cylindrical portion which fits closely into the hoop of the parent cell, and in some species coalesces with it. The hoop of the parent cell in such a case becomes thickened, and forms a cylindrical mantle on the upper side of the spore (*Ch. curvisetum* Cl., *Ch. contortum*, Schütt).

The spore lies either in the middle of the parent cell (*Ch. Schüttii* Cl., etc.) or on one side, nearer to one valve than to the other (*Ch. lacinosum* Schütt, etc.). In the latter case, it always turns its inferior side (secondary valve) towards the nearest of the valves of the parent cell. It may be so much to one side, that the inferior side touches the valve of the parent cell and coalesces with it; in this case, the spore parent cells carry peculiar setæ, by



sammen med undersiderne mod hinanden (*Ch. didymum* Ehr., *Ch. furcellatum* Bail., *Ch. cinctum* n. sp.).

Paa grund af den eiendommelige celledeling og auxosporedannelsen varierer kjedernes bredde (*s*) indenfor temmelig vide grænser for hver enkelt art. De nye kjeder, som udgaar af auxosporen, er i de iagttagne tilfælde  $2\frac{1}{2}$ —3 gange saa brede som de gamle; men der forekommer endnu større variationer. I et enkelt præparat fra Atlanterhavet har jeg saaledes fundet *Ch. decipiens* Cl. varierende fra 12—78  $\mu$ ; i pelagiske prøver har jeg i det hele fundet variationerne størst; flere arter kan under disse forhold blive meget smalere, end jeg ellers har kunnet finde dem; det synes derfor, som om auxosporedannelsen paa det aabne hav foregaar forholdsvis sjældnere end nær kysten.

Medens bredden (*s*) varierer temmelig sterkt, er tykkelsen (*t*) næsten konstant; cellens omrids i sidestilling kan derfor hos en og samme art variere fra cirkelform til en temmelig fladtrykt ellipse. Cellens længde (*l*) varierer mindre end bredden, men altid i omvendt forhold til denne; forholdet mellem bredde og længde (*s:l*) vil derfor hos de fleste arter variere overordentlig, saa at det har liden eller ingen betydning som systematisk karakter. Schütt har (1895) beskrevet nogle arter, som alene ved denne eller lignende karakterer adskiller sig fra andre; jeg anser disse ikke engang for selvstændige varieteter. (Saaledes er *Ch. medium* Schütt og *Ch. compressum* Schütt = *Ch. contortum* Schütt, *Ch. procerum* Schütt = *Ch. Schüttii* Cl., *Ch. Grunowii* Schütt = *Ch. decipiens* Cl., *Ch. Clevei* Schütt = *Ch. diadema* Ehr., *Ch. compactum* Schütt = *Ch. atlanticum* Cl.).

Af noget større betydning er baandcylinders længde i forhold til cellens længde; i vegetative celler er den nogenlunde konstant, hos de fleste arter omtrent  $\frac{1}{3}$  af cellens længde; under sporedannelsen forøges den sterkt, og ved auxosporedannelsen dannes der to baand. Hos enkelte arter er baandet altid meget kort (*Ch. Schüttii* Cl., *Ch. Ralfsii* Cl., *Ch. affine* Lauder), hos andre langt cylindrisk (*Ch. teres* Cl., *Ch. lacinosum* Schütt).

Kromatofoernes form, antal og stilling har stor systematisk betydning. Saaledes deler disse karakterer slegten meget naturlig i underslegterne *Phæoceros* og *Hyalochæte*, og arterne indenfor den sidstnævnte underslegt kan ogsaa paa en naturlig maade grupperes efter kromatofoerne. Deres antal og stilling er nemlig i det store og hele konstant; en undtagelse danner *Ch. lacinosum* Schütt, hvor antallet varierer fra 2 til 1, eftersom cellen er smal og lang eller bred og kort. Den sidstnævnte form er af Schütt beskrevet som særskilt art under navn af *Ch. breve* Schütt.

which the spores are binately conjoined, with their inferior sides towards one another (*Ch. didymum* Ehr., *Ch. furcellatum* Bail., *Ch. cinctum* n. sp.).

On account of the peculiar cell-division and auxospore formation, the width (*s*) of the filaments varies within rather wide limits in each separate species. The new chains which issue from the auxospores are, in the cases observed, from  $2\frac{1}{2}$  to 3 times as broad as the old ones, and even greater variations occur. For instance, in a single preparation from the Atlantic Ocean, I have found *Ch. decipiens* Cl. varying from 12 to 78  $\mu$ . Upon the whole, I have found the greatest variations in pelagic samples, many species, under these conditions, being much narrower than I have elsewhere found them to be. It therefore seems as if auxospore formation occurs less frequently in the open sea than near the shore.

While the width (*s*) varies considerably, the thickness (*t*) is almost invariable; the contour of the cell, in a side view, may therefore, in one species, vary between a circle and a rather flat ellipse. The length (*l*) of the cell varies less than the width, but always in an inverse ratio; so that the proportion between the width and the length (*s:l*) will, in most species, vary very much, and thus be of little or no importance as a systematic character. Schütt, in 1895, described some species which are distinguished from others only by this or similar characters; but I do not even consider these to be independent varieties (such are *Ch. medium* Schütt and *Ch. compressum* Schütt = *Ch. contortum* Schütt, *Ch. procerum* Schütt = *Ch. Schüttii* Cl., *Ch. Grunowii* Schütt = *Ch. decipiens* Cl., *Ch. Clevei* Schütt = *Ch. diadema* Ehr., *Ch. compactum* Schütt = *Ch. atlanticum* Cl.).

The length of the hoop-cylinder in proportion to that of the cell is of somewhat greater importance. In vegetative cells, the former is to a certain extent constant, being in most species about  $\frac{1}{3}$  the length of the cell; during the formation of the spores, it is very much increased, and in the auxospore formation, two hoops are formed. In a few species, the hoop-cylinder is always very short (*Ch. Schüttii* Cl., *Ch. Ralfsii* Cl., *Ch. affine* Lauder), in others long (*Ch. teres* Cl., *Ch. lacinosum* Schütt).

The shape, number and position of the chromatophores, is of great systematic importance, so that these characters divide the genus very naturally into the subgenera *Phæoceros* and *Hyalochæte*. The species in the last-named sub-genus can also be grouped naturally according to the chromatophores. Their number and position are on the whole constant; but *Ch. lacinosum* Schütt forms an exception to this rule, the number there varying from 2, when the cell is long and narrow, to 1, when it is short and broad. The latter form has been described by Schütt as a separate species under the name of *Ch. breve* Schütt.

## Subgenus I.

## Phæoceros, Gran mscr.

Hornene tykke, ofte tornede, hule med protoplasma og kromatoferer, som flyder ud, naar de brækkes over. Cellekjerne centralstillet, kromatofererne talrige, helt eller tilnærmelsesvis kugleformede, plastiske, fordelte i protoplasmaet omkring kjernen, langs væggene og i hornene. Hvile-sporene kjendes ikke.

A. Hornenes rødder ligger i sagittalplanet.

$\alpha$ . Hornene alle næsten i ét plan (sagittalplanet), krydsende hverandre uden bøining under en omtrent ret vinkel.

1. *Ch. atlanticum*, Cl.

$\beta$ . Hornene divergerende i alle retninger, bøiede udover ved sammenvoksningspunkterne.

2. *Ch. boreale*, Cl.

B. Hornenes udgangspunkter ligger udenfor sagittalplanet; linjerne mellem dem danner spidse vinkler med dette, afvekslende til begge sider.

$\alpha$ . Cellerne enkeltvis eller i korte kjeder.

3. *Ch. danicum*, Cl.

$\beta$ . Cellerne i længere kjeder, hornene afbøiede fra kjedens ene ende mod den anden.

4. *Ch. Brightwellii*, Cl.

### 1. *Chætoceros atlanticum*, Cl. (1873, 13) p. 11, T. II, fig. 8.

Fig. *Ch. atlanticum*, var. *tumescens*, Grun. Van Heurck. Synopsis. T. 81, fig. 6.

Descr. *Ch. atlanticum*, Cl. (1894) p. 11.

Syn. *Ch. compactum*, Schütt (1895) p. 46, fig. 23.

Denne art er let kjendelig efter *Cleves* beskrivelse og tegninger. Kjedens bredde har jeg fundet varierende fra 15—38.5  $\mu$ .

*Vegetationstid.* Hele aaret.

*Forekomst.* Atlanterhavet (Nordhavsexp., *Bie*), Vestkysten (*Hjort*, *Nordgaard*), Lofoten (*Nordgaard*) Christianiafjorden.

*Udbredelse.* Atlanterhavet—Ishavet—Skagerak.

### 2. *Chætoceros boreale*, Bail.

Fig. Brightw. (1856) T. VII, fig. 12—15.

„ Cleve (1873, 13) T. II, fig. 7 *a*, *d*.

Descr. Cleve (1894) p. 12.

Kjederne rette, bredde 14—41  $\mu$ . Cellerne i frontstilling rektangulære med skarpe, stumpvinklede hjørner. Skallerne begge omtrent lige konvekse, foramina fladtrykt sekskantede. Kromatoferer talrige, næsten kugleformede, fordelte i cellen og i hornene. Hornene tykke, udgangspunkterne i sagittalplanet indenfor skallens rand, paa begge skaller i omtrent lige indbyrdes afstand. Hornene gaar i skraa retning til sammenvoksningspunktet, derefter tværs paa kjedens længdeakse i forskellige retninger; de er tornede især i sin ydre del, hvor de kan være fortykkede og næsten kantede.

*Vegetationstid.* Hele aaret.

*Forekomst.* Alle have.

## Sub-genus I.

## Phæoceros, Gran mscr.

Setæ thick, often spinous, hollow and filled with protoplasm and chromatophores, which escape when the setæ are broken. Cell-nucleus situated centrally, chromatophores numerous, perfectly or approximately spherical in shape, plastic, distributed in the protoplasm round the nucleus, along the walls, and in the setæ. Spores unknown.

A. The roots of the setæ in the sagittal plane.

$\alpha$ . Setæ nearly all in one plane (sagittal plane) crossing one another without curve, at almost a right angle.

1. *Ch. atlanticum*, Cl.

$\beta$ . Setæ diverging in all directions, curving out at the points of coalescence.

2. *Ch. boreale*, Cl.

B. Insertions of the setæ situated outside the sagittal plane, the lines between them forming acute angles with it, alternately on each side.

$\alpha$ . Cells single or in short chains.

3. *Ch. danicum*, Cl.

$\beta$ . Cells in longer chains; setæ deflected from the one end of the chain towards the other.

4. *Ch. Brightwellii* Cl.

### 1. *Chætoceros atlanticum*, Cl. (1873, 13), p. 11, Pl. II, fig. 8.

Fig. *Ch. atlanticum*, var. *tumescens* Grun. Van Heurck Synopsis, Pl. 81, fig. 6.

Descr. *Ch. atlanticum*, Cl. (1894) p. 11.

Syn. *Ch. compactum*, Schütt (1895) p. 46, fig. 23.

This species is easily recognisable from *Cleve's* description and drawings. The width of the filaments I have found to vary from 15 to 38.5  $\mu$ .

*Period of Vegetation.* The whole year.

*Occurrence.* Atlantic (Norw. N. Atl. Exp., *Bie*), W. coast of Norway (*Hjort*, *Nordgaard*), Lofoten (*Nordgaard*), Christiania Fjord.

*Distribution.* Atlantic Ocean, Arctic Ocean, Skagerak.

### 2. *Chætoceros boreale*, Bail.

Fig. Brightw. (1856) Pl. VII, figs. 12—15.

„ Cleve (1873, 13) Pl. II, fig. 7 *a*, *d*.

Descr. Cleve (1894) p. 12.

Chains straight, width 14—41  $\mu$ . Cells, in a front view, rectangular with pointed, obtuse-angled corners. Valves almost equally convex; foramina compressed hexagonal. Chromatophores numerous, almost spherical, distributed in the cell and in the setæ. Setæ thick, insertions in the sagittal plane within the edge of the valve, in both valves at about the same mutual distance. The setæ run in an oblique direction to the point of coalescence, and then transversely to the long axis of the filament in different directions; they are spinous, especially in their distal part, where they may be thickened and almost angular.

*Period of Vegetation.* The whole year.

*Occurrence.* All oceans.



### 3. *Chætoceros danicum*, Cl. (1885) p. 55.

Deser. Cleve (1894) p. 12.

Fig. *Ch. Wighami*, Van Heurck. Synopsis. T. 82, fig. 1.

*Forekomst.* Kristianiafjorden, sjelden.

*Udbredelse.* Østersøen—Kattegat.

### 4. *Chætoceros Brightwellii*, Cl. T. I, fig. 1 a—c.

Syn. *Chætoceros boreale*  $\beta$  *Brightwellii*, Cl. (1873, 13) T. II.

fig. 7 b, c, c.

— *convolutum*, Castr. (1886) p. 77.

— *boreale*, Cl. p. p. (1894) p. 12.

Kjederne rette, bredde 12—24  $\mu$ , deres ender forskellige, hornene bøiede fra den øvre mod den nedre. Cellerne i frontstilling rektangulære, hjørnerne paa oversiden afrundede, paa undersiden skarpe. Skallerne ulige, den ene hvælvet, den anden næsten plan. Hornenes udgangspunkter udenfor sagittalplanet, linjen mellem dem gaar gennem kjedens længdeakse og danner en spids vinkel afvekslende paa begge sider af sagittalplanet. Udgangspunkterne ligger paa den plane skal nær randen, paa den konvexe nærmere midten. Hornene temmelig tykke, nær udgangspunktet bøiede; tornene mindre end hos *Ch. boreale*. Foramina fladt trapezformede eller ganske lukkede af de skjævt udgaaende horn.

*Udbredelse.* Atlanterhavet.

## Subgenus II.

### *Hyalochæte*, Gran mscr.

Hornene tynde, farveløse. Cellekjerne vægstillet, kromatoforer pladeformede, vægstillede. Hvilesporer kjendes hos de fleste arter.

#### A. Kromatoforer flere end to i hver celle.

##### a. Grove kjeder med differentierede terminalhorn.

\* Kromatoforer 4—10 større plader, hornene sammenvoksede et kort stykke efter længden. 5. *Ch. decipiens*, Cl.

\*\* Kromatoforer talrige smaa plader, hornene kun ved udgangspunktet sammenvoksede. 6. *Ch. teres*, Cl.

##### b. Spædere kjeder uden differentierede terminalhorn, men paa nogle steder med intermediære horn fortykkede, longitudinalt afbøiede i samme retning.

7. *Ch. contortum*, Schütt.

#### B. Kromatoforerne trykkede op mod skallerne bund, 2 (hos *Ch. laciniosum* undertiden 1) i hver celle.

##### I. Kjederne rette, hornene direkte sammenvoksede.

a. Foramina todelte, skallerne berører hinanden i midten.

8. *Ch. simile*, Cl.

##### b. Foramina udelte, skallerne konkave.

\* Skallerne med en halvkugleformig udvækst i midten, sporerne helt ensidig i modercellerne, sammenknyttede parvis 9. *Ch. didymum*, Ehr.

\*\* Skallerne konkave, paa midten svagt eller ikke hvælvede, sporerne enkeltvis.

### 3. *Chætoceros danicum*, Cl. (1885) p. 55.

Deser. Cleve (1894) p. 12.

Fig. *Ch. Wighami*, Van Heurck Synopsis. Pl. 82, fig. 1.

*Occurrence.* Christiania Fjord, rare.

*Distribution.* Baltic, Kattegat.

### 4. *Chætoceros Brightwellii*, Cl. Pl. I, fig. 1 a—c.

Syn. *Chætoceros boreale*  $\beta$  *Brightwellii* Cl. (1873, 13) Pl. II,

fig. 7 b, c, c.

— *convolutum* Castr. (1886) p. 77.

— *boreale* Cl. p. p. (1894) p. 12.

Filaments straight, width 12—24  $\mu$ , extremities different, the setæ bent from the upper towards the lower. Cells, in a front view, rectangular, the angles on the upper side rounded, on the under side sharp. Valves unequal, the one convex, the other almost flat. Insertions of the setæ outside the sagittal plane, the line between them passing through the long axis of the filament, and forming an acute angle alternately on each side of the sagittal plane. The insertions upon the flat valve are near the edge, upon the convex valve, nearer the middle. Setæ rather thick, curved near the point of issue; spines fewer than in *Ch. boreale*. Foramina flatly trapeziform in shape, or completely closed by the obliquely projecting setæ.

*Distribution.* Atlantic Ocean.

## Sub-genus II.

### *Hyalochæte*, Gran mscr.

Setæ thin, colourless. Nucleus situated in the wall; chromatophores lamelliform, situated in the wall. Spores found in most of the species.

#### A. Chromatophores more than 2 in each cell.

##### a. Coarse filaments with differentiated terminal setæ.

\* Chromatophores 4—10 large lamellæ; setæ coalesced for a short portion of their length. 5. *Ch. decipiens*, Cl.

\*\* Chromatophores numerous small lamellæ; setæ coalesced only at the insertion. 6. *Ch. teres*, Cl.

##### b. More slender filaments without differentiated terminal setæ, but in some places with intermediary setæ thickened and longitudinally deflected in the same direction.

7. *Ch. contortum*, Schütt.

#### B. Chromatophores pressed close up to the bottom of the valves, 2 in each cell (in *Ch. laciniosum* sometimes 1).

##### I. Filaments straight, setæ directly coalesced.

a. Foramina bi-partite, valves touching one another in the middle. 8. *Ch. simile*, Cl.

##### b. Foramina single, valves concave.

\* Valves with a hemispherical protuberance in the middle, spores situated quite at one side, connected in pairs. 9. *Ch. didymum*, Ehr.

\*\* Valves concave, not convex, or only slightly so, in the middle; spores single.



- a.* Sporerne glatte, noget ensidig stillede, cellernes hjørner berører hverandre ikke.  
10. *Ch. laciniosum*, Schütt.
- β.* Sporerne tornede, beliggende midt i modercellerne, cellerne berører hverandre med hjørnerne.  
11. *Ch. constrictum*, n. sp.
- II. Hornene ikke direkte sammenvoksede, forbundne med en kort stift.  
23. *Ch. externum*, n. sp.
- C. Kromator 1 i hver celle, frontstillet (trykket op mod en af baandets brede sider).
- I. Kjederne rette eller svagt uregelmæssig bøiede, ikke forenede i slimhyllede kolonier.
- a.* Cellerne berører hverandre med hjørnerne.  
\* Kjederne mangelcellede, over 9  $\mu$  brede.  
*a.* Terminalhorn differentierede, meget kortere end de øvrige.  
§. Terminalhorn divergerende en stump vinkel.  
12. *Ch. Schüttii*, Cl.  
§§. Terminalhorn divergerende en spids vinkel.  
13. *Ch. Willei*, n. sp.  
*β.* Terminalhorn i længde og tykkelse lig de øvrige horn.  
§. Foramina spalteformede eller manglende.  
16. *Ch. crinitum*, Schütt.  
§§. Foramina lancetformede.  
17. *Ch. coronatum*, n. sp.
- \*\* Kjederne faacellede, 5—15  $\mu$  brede.  
*a.* Foramina spalteformede.  
26. *Ch. Wighami*, Brightw.  
*β.* Foramina bredt lancetformede.  
27. *Ch. biconcavum*, n. sp.
- b.* Cellernes hjørner berører hverandre ikke.  
\* Terminalhorn skarpt differentierede.  
*a.* Sporerne primærskal med grenede torne, sekundærskallen glat.  
14. *Ch. diadema*, Ehr.  
*β.* Sporerne skaller begge med ugrenede torne.  
15. *Ch. seiracanthum*, n. sp.
- \*\* Terminalhorn ikke differentierede.  
*a.* Hornene lyreformig transversalt udboiede, med forkisledede ugrenede haar.  
20. *Ch. scolopendra*, Cl.  
*β.* Hornene glatte, oftest rette; sporerne parvis forenede, sammenvoksede med modercellernes skaller, som bærer eiendommelige, fortykkede horn, der er sammenvoksede til et stykke ovenfor roden.  
§. Sporemodercellernes horn tilbagebøiede.  
21. *Ch. cinctum*, n. sp.  
§§. Sporemodercellernes horn meget svagt divergerende.  
22. *Ch. furcellatum*, Bail.
- II. Kjederne spiralformig bøiede, hornene alle bøiede mod spirallens ydre side; terminalhorn ikke differentierede.  
*a.* Cellerne berører hverandre med hjørnerne.  
18. *Ch. curvisetum*, Cl.  
*b.* Cellerne berører hverandre ikke med hjørnerne.  
19. *Ch. debile*, Cl.
- III. Kjederne bøiede, forenede til kolonier ved et slimhylle. Nogle af hornene forlængede i sagittal retning, sammenfiltrede i koloniens midte.  
*a.* Foramina smale, sporerne glatte.  
24. *Ch. sociale*, Lauder.  
*b.* Foramina næsten af cellernes bredde, sporerne fint tornede.  
25. *Ch. radians*, Schütt.
- D. Cellerne ikke forenede i kjeder, kromatorer 2, sagittalt stillede.  
28. *Ch. gracile*, Schütt.

- a.* Spores somewhat on one side, smooth, corners of the cells not touching one another.  
10. *Ch. laciniosum*, Schütt.
- β.* Spores in the middle, spinous, cells touching one another at the corners.  
11. *Ch. constrictum*, n. sp.
- II. Setæ not directly coalesced, but connected by a short siliceous thread.  
23. *Ch. externum*, n. sp.
- C. Chromatophore 1 in each cell, situated in front (pressed up to one of the broad sides of the hoop).
- I. Chains straight or irregularly curved, not united into gelatinous colonies.  
*a.* Cells touching one another at the angles.  
\* Chains multicellular, more than 9  $\mu$  broad.  
*a.* Terminal setæ differentiated, much shorter than the others.  
§. Terminal setæ diverging at an obtuse angle.  
12. *Ch. Schüttii*, Cl.  
§§. Terminal setæ diverging at an acute angle.  
13. *Ch. Willei*, n. sp.  
*β.* Terminal setæ in length and thickness like the other setæ.  
§. Foramina linear or absent.  
16. *Ch. crinitum*, Schütt.  
§§. Foramina lanceolate.  
17. *Ch. coronatum*, n. sp.
- \*\* Chains few-celled, 5 to 15  $\mu$  broad.  
*a.* Foramina linear.  
26. *Ch. Wighami*, Brightw.  
*β.* Foramina broadly lanceolate.  
27. *Ch. biconcavum*, n. sp.
- b.* Corners of the cells not touching one another.  
\* Terminal setæ sharply differentiated.  
*a.* Primary valve of the spores with ramified spines, secondary valve smooth.  
14. *Ch. diadema*, Ehr.  
*β.* Both valves of the spores with unramified spines.  
15. *Ch. seiracanthum*, n. sp.
- \*\* Terminal setæ not differentiated.  
*a.* Setæ lyrate transversally bent outwards, furnished with siliceous unramified cilia.  
20. *Ch. scolopendra*, Cl.  
*β.* Setæ smooth, generally straight; spores binately conjoined, coalesced with the valves of the mother cells, which carry peculiar, thickened setæ, coalesced for a short distance above the base.  
§. Setæ of the spore mother cells recurved.  
21. *Ch. cinctum*, n. sp.  
§§. Setæ of the spore parent cells very slightly divergent.  
22. *Ch. furcellatum*, Bail.
- II. Filaments spirally curved, setæ all deflected towards the outer side of the spiral; terminal setæ undifferentiated.  
*a.* Cells touching each other at the angles.  
18. *Ch. curvisetum*, Cl.  
*b.* Cells not touching each other at the angles.  
19. *Ch. debile*, Cl.
- III. Filaments curved, united into colonies by a gelatinous investment. A few setæ elongated in a sagittal direction, matted together in the middle of the colony.  
*a.* Foramina narrow, spores smooth.  
24. *Ch. sociale*, Lauder.  
*b.* Foramina almost the width of the cells, spores finely spinous.  
25. *Ch. radians*, Schütt.
- D. Cells not connected in filaments, chromatophores 2, situated sagittally.  
28. *Ch. gracile*, Schütt.

**5. Chætoceros decipiens**, Cl. (1873, 13) p. 11, T. I, fig. 5.

Tab. nostr. I, fig. 2, 3, T. III, fig. 34.

Syn. *Ch. decipiens* v. *concreta*, Grun. (1880) p. 120.

„ *concretum*, Grun. in Engler (1883) p. XI.

„ *Grunowii*, Schütt (1895) p. 43, fig. 14 a, b.

Kjederne rette, stive, flercellede, mere eller mindre sammentrykte, 12—78  $\mu$  brede.

Cellerne i frontstilling rektangulære med skarpe, ofte fremspringende hjørner. Skallerne mere eller mindre konkave, foramina cirkulære, ovale eller næsten spalteformede, med svag indsnøring paa midten. Baandets længde variabel, omkring  $\frac{1}{3}$  af cellens længde.

Cellekjerne og kromatoforer vægstillede, kromatoforerne pladeformede, forholdsvis store, 4—10 i hver celle.

Cellerne berører hverandre med skarpe hjørner, fra hvilke hornene gaar ud i sagittal retning, sammenvoksede paa en kort strækning; derefter divergerer de svagt bueformig i transversal retning, symmetrisk i forhold til sagittalplanet, afbøies desuden longitudinalt i retning af filamentets nærmeste ende.

Terminalhorn skarpt differentierede, kortere og tykkere end de andre, stribede paa tværs; de gaar ud i sagittalplanet i skraa retning, afbøies derefter mod longitudinalaksen, saa at de bliver næsten parallelle med denne.

Hvilesporer ukjendte.

Varierer meget især med hensyn til cellevæggens og hornenes tykkelse og formen af foramina. Som yderformer kan adskilles:

*f. hiemalis*, Gran mscr. T. I, fig. 2.

Cellevæggen sterkt forkislet, tyk, hornene tykke, foramina smale, næsten spalteformede med svag indsnøring paa midten. Vegeterer især i februar—marts.

*f. interrupta*, Gran mscr. T. III, fig. 34.

Svagere forkislet, hornene tynde, skallerne sterkt konkave, foramina i de smaleste kjeder cirkulære, hos de bredere mere eller mindre langstrakt ovale. Vegeterer især om sommeren.

*Ch. decipiens* er den almindeligste af alle vore arter, vegeterer til alle årstider og findes næsten overalt ved vore kyster, om end ofte sparsomt.

*Udbredelse.* N. Atlanterhav i store mængder. Ishavet, Nordsøen, Skagerak—Østersøen (Engler, Schütt).

**6. Chætoceros teres**, Cl. (1896, 5) p. 30, fig. 7.

Tab. III, fig. 35—36.

Kjederne rette, ikke snoede, omtrent cylindriske, 18—48  $\mu$  brede. Cellerne i frontstilling rektangulære med skarpe hjørner, oftest længere end filamentets bredde, i sidestilling cirkulære-elliptiske, i sagittalstilling forlænget elliptiske.

**5. Chætoceros decipiens**, Cl. (1873, 13) p. 11, Pl. I, fig. 5.

Pl. I, figs. 2, 3; Pl. III, fig. 34.

Syn. *Ch. decipiens* v. *concreta*, Grun. (1880) p. 120.

„ *concretum*, Grun. in Engler (1883) p. XI.

„ *Grunowii*, Schütt (1895) p. 43, fig. 14, a, b.

Filaments straight, stiff, multicellular, more or less compressed, 12—78  $\mu$  wide.

Cells, in a front view, rectangular, with sharp, often projecting angles. Valves more or less concave, foramina circular, oval or almost linear, with slight constriction in the middle. Length of the hoop variable, about  $\frac{1}{3}$  that of the cell.

Nucleus and chromatophores situated in the wall; chromatophores lamelliform, comparatively large, from 4 to 10 in each cell.

The cells touch one another with sharp angles, from which the setæ issue in a sagittal direction, coalesced for a short distance, afterwards diverging, with a slight curve, in a transverse direction, symmetrically in relation to the sagittal plane, being moreover, deflected longitudinally in the direction of the nearest end of the filament.

Terminal setæ sharply differentiated, shorter and thicker than the others, striated transversely; they spring from the sagittal plane in an oblique direction, being afterwards deflected towards the longitudinal axis, thereby becoming almost parallel with it.

Spores unknown.

Varies greatly, especially with regard to the thickness of the cell walls, and the shape of the foramina. As extreme forms the following may be specially mentioned:

*f. hiemalis*, Gran mscr. Pl. I, fig. 2.

Cell walls very siliceous, thick; setæ thick; foramina narrow, almost linear, with slight constriction in the middle. Vegetates more especially in February and March.

*f. interrupta*, Gran mscr. Pl. III, fig. 34.

Less siliceous, setæ thin, valves deeply concave, foramina in the narrower cells circular, in the broader, more or less of an elongated oval shape. Vegetates more especially in the summer.

*Ch. decipiens* is the commonest of our (Norwegian) species, vegetates at all seasons of the year, and is found almost everywhere on our (Norwegian) coasts, though often sparingly.

*Distribution.* N. Atlantic Ocean in great quantities; Arctic Ocean, North Sea, Skagerak, Baltic (Engler, Schütt).

**6. Chætoceros teres**, Cl. (1896, 5) p. 30, fig. 7.

Pl. III, figs. 35, 36.

Filaments straight, not twisted, almost cylindrical, 18—48  $\mu$  wide. Cells, in a front view, rectangular with sharp angles, often longer than the width of the filament; in a side view, circular to elliptical; in a sagittal view, elongated elliptical.





Foramina spalteformede, svagt indsnorede paa midten. Baandet langt cylindrisk, mere end halvdelen af cellens længde, svagt forkislet, saa at det ved indtørring falder sammen og løsner fra de sterkere skaller.

Cellekjerne og kromatoforer vægstillede, de sidste talrige, smaa, pladeformede med rundagtig eller forlænget omkreds.

Cellerne berører hverandre med hjørnerne, hornene ganske kort sammenvoksede ved udgangspunktet, udgaar fra cellehjørnerne tværs paa længdeaxen, divergerer indbyrdes næsten en ret vinkel, symmetrisk i forhold til sagittalplanet.

Terminalhorn differentierede, noget tykkere end de øvrige, svagt bøiede, udgaaende i sagittalplanet, divergerende en spids vinkel.

Hvilesporer i forlængte moderceller, beliggende midt i disse. Skallerne glatte, omtrent lige meget hvælvede, primærskallen med en krans af fine punkter langs den nedre rand. \*)

*Vegetationstid.* Hele aaret, især vinter og vaar. Hvilesporer i marts—juni.

*Forekomst.* Spredt langs kysten fra Christianiafjorden til Lofoten.

Marstenen fyr juni 96 (*Hjort*), Stavanger—Bergen februar 96 (*Nordgaard*), Drøbak, Bygdø februar—marts 96, Lofoten april 96 (*Nordgaard*), Atlanterhavet mai 96 (*Bie*), Drøbak august (frk. *Bonnerie*) og september 96.

*Udbredelse.* N. Atlanterhav—Skagerak.

Denne art staar nærmest *Ch. Weissflogii*, Schütt fra Østersøen; den adskilles fra denne ved hvilesporerne og ved sin større grovhed.

## 7. *Chætoceros contortum*, Schütt (1895) p. 44.

Tab. II, fig. 32.

Fig. *Chætoceros* sp. Schütt (1888) T. III, fig. 4.

Syn. *Ch. compressum*, Cl. (1894) p. 12, T. II, fig. 3. ) (non *Lauder*).

" " Schütt (1895) p. 43, fig. 16 a, b )

" *medium*, Schütt (1895) p. 43, fig. 15.

Kjederne rette, mere eller mindre snoede, 8—22  $\mu$  brede. Cellerne i frontstilling rektangulære-kvadratiske med afrundede hjørner og hvælvede skaller, foramina afrundet rektangulære — spalteformede, smalest paa midten. Baandet langt cylindrisk, sømmene utydelige.

Kromatoforer 4—10, vægstillede.

Hornene udgaar indenfor skallernes hjørner i skraa retning, krydses ovenfor udgangspunktet i hvide med kjedens rand. De er tynde, svagt bøiede, divergerer en spids vinkel.

I filamentets midtre del findes oftest paa et eller flere steder 4 korte, tykkere, svagt snoede, nedadbøiede

\*) Den spore, som er afbildet hos *Cleve* (1896, 5) fig. 11, tilhører uden tvil denne art. De fine haar paa den sekundære skal er meget vanskelige at se, og deres forekomst synes ikke at være konstant.

Foramina linear, slightly constricted in the middle. Hoop long cylindric, length more than half that of the cell, slightly siliceous, so that when dry, it falls to pieces, and is detached from the stronger valves.

Nucleus and chromatophores situated in the wall, the latter numerous, small, lamelliform, with rounded or elongated periphery.

Cells touching one another at the angles, setæ quite short, coalesced at the base, issuing from the corners of the cells perpendicularly to the long axis, diverging at almost a right angle, symmetrically in relation to the sagittal plane.

Terminal setæ differentiated, somewhat thicker than the rest, slightly curved, springing from the sagittal plane, diverging at an acute angle.

Spores in elongated parent cells, and situated in the middle of them. Valves smooth, about equally vaulted, primary valve with a wreath of minute puncta along the lower margin. \*)

*Period of Vegetation.* The whole year, especially winter and spring. Spores from March to June.

*Occurrence.* Scattered along the coast of Norway, from the Christiania Fjord to Lofoten.

Marstenen Beacon, June 1896 (*Hjort*); from Stavanger to Bergen, Feb. 1896 (*Nordgaard*); Drøbak, Bygdø, Feb., March 1896; Lofoten, April 1896 (*Nordgaard*), Atlantic, May 1896 (*Bie*); Drøbak, Aug. 1896 (*Miss Bonnerie*) and Sept. 1896.

*Distribution.* N. Atlantic Ocean, Skagerak.

This species is the one most nearly related to *Ch. Weissflogii*, Schütt, from the Baltic; it is distinguished from it by the spores and by its coarser appearance.

## 7. *Chætoceros contortum*, Schütt (1895) p. 44.

Pl. II, fig. 32.

Fig. *Chætoceros* sp. Schütt (1888) Pl. III, fig. 4.

Syn. *Ch. compressum*, Cl. (1894) p. 12, Pl. II, fig. 3. ) (not *Lauder*).

" " Schütt (1895) p. 43, fig. 16 a, b )

" *medium*, Schütt (1895) p. 43, fig. 15.

Filaments straight, more or less twisted, 8—22  $\mu$  wide. Cells, in a front view, rectangular to square, with rounded corners and convex valves; foramina from rounded rectangular to linear, narrowest in the middle. Hoop of a long cylindrical shape, sutures indistinct.

Chromatophores from 4 to 10, situated in the wall.

Setæ issuing from within the angles of the valves in an oblique direction, are crossed above the insertion on a level with the margin of the filament. They are thin, slightly curved, diverging at an acute angle.

In the middle of the filament there are found, generally in one place or more, 4 short, thicker, slightly

\*) The spore, figured by *Cleve* (1896, 5) fig. 11, belongs without doubt to this species. The fine hairs in the lower valve are very difficult to see, and their occurrence does not appear to be constant.



horn, som danner et næsten retvinklet kors. Terminalhorn ikke differentierede.

Hvilesporer noget ensidig i modercellerne; primærskallen med en krans af korte tænder langs den øvre rand, sammenvokset med modercellens fortykkede baand. Begge skaller forøvrigt glatte, omtrent ensformig hvælvede.

*Vegetationstid.* Hele aaret, især sommer og høst. Hvilesporér juni—november.

*Forekomst.* Christianiafjord—vestkysten november 93 (*Hjort*), Marstenen juni 95 (*Hjort*), Drøbak og vestkysten (*Nordgaard*) februar—marts 96. Lofoten april 96 (*Nordgaard*), Vestkysten juni 96 (*S. Müller*), Bergensfjorden juni—august 96 (*Nordgaard*), Drøbak august—september 96 (frk. *Bonnevie*).

*Udbredelse.* Atlanterhavet—Østersøen—Ishavet.

Jeg er i tvil, om Schütt har ret i at skille denne art fra Lauder's *Ch. compressum* (Lauder 1864, p. 78, t. VIII, fig. 6). De karakterer, som skiller den fra *Ch. compressum* Schütt, er uden al systematisk værdi; netop med hensyn til kjedens bredde og til skallens omrids i sidestilling varierer alle *Chætoceros*-arter umaadelig, kromatoforenes antal og størrelse varierer ogsaa til en vis grad, og de smalere kjeder er baade hos denne og hos andre arter meget sterkere snoede end de brede. Derfor henfører jeg uden tvil baade *Ch. compressum* Schütt og *Ch. medium* Schütt til *Ch. contortum*.

Om denne er identisk med *Ch. compressum*, Lauder, faar fremtidige undersøgelser afgjøre; hvis *Ch. ciliatum*, Lauder (l. c. T. VIII, fig. 2) er en sporebærende form af *Ch. compressum*, som Cleve (l. c. 1894) antager, er arterne sikkert forskellige.

#### 8. *Chætoceros simile*, Cl. (1896, 5) p. 30, fig. 1.

Tab. IV, fig. 55.

Kjederne faacellede, 7—17  $\mu$  brede.

Cellerne i frontstilling rektangulære med skarpe hjørner.

Skallerne plane med en pukkel paa midten, hvor de berører hverandre. Foramina todelte, længere end filamentets bredde.

Kromatoforer 2, stillede op mod skallerne.

Hornene rette, stive, udgaaende fra cellernes hjørner i sagittal retning, krydsende hverandre udenfor filamentets rand, oftest med hele sin længde beliggende næsten i sagittalplanet, krydsende hverandre under spidse vinkler.

Terminalhorn sterkt divergerende, tykkere end de andre, men med samme retning som disse.

Hvilesporér (if. *Cleve*) midt i modercellerne, med næsten ensformig hvælvede, tornede skaller.

*Vegetationstid.* Vinter og vaar.

twisted, downward-curved setæ, forming an almost right-angled cross. Terminal setæ not differentiated.

Spores somewhat on one side in the parent cell; primary valve with a wreath of small denticles along the upper margin, coalesced with the thickened hoop of the parent cell. Both valves otherwise smooth, almost uniformly vaulted.

*Period of Vegetation.* The whole year, but especially summer and autumn. Spores from June to November.

*Occurrence.* Christiania Fjord, W. coast of Norway, Nov. 1893 (*Hjort*); Marstenen, June 1895 (*Hjort*); Drøbak and W. coast of Norway (*Nordgaard*), Feb., March, 1896; Lofoten, April 1896 (*Nordgaard*); W. coast of Norway, June 1896 (*S. Müller*); Bergen Fjord, June, July, Aug. 1896 (*Nordgaard*); Drøbak, Aug., Sept. 1896 (Miss *Bonnevie*).

*Distribution.* Atlantic, Baltic, Arctic.

I am doubtful whether Schütt is right in separating this species from Lauder's *Ch. compressum* (Lauder 1864, p. 78. Pl. VIII, fig. 6). The characters which distinguish it from *Ch. compressum* Schütt, are entirely without systematic value; for it is just with regard to the width of the filament, and to the contour of the valve in a side view, that all *Chætoceros* species vary so greatly. The number and size of the chromatophores also vary to a certain extent, and the narrower chains, in this as in other species, are far more twisted than the broad ones. I therefore without hesitation refer both *Ch. compressum* Schütt and *Ch. medium* Schütt to *Ch. contortum*.

Whether the last-named form is identical with *Ch. compressum*, Lauder, future investigations must decide. If *Ch. ciliatum*, Lauder (l. c. Pl. VIII, fig. 2) is a spore-bearing form of *Ch. compressum*, as Cleve (l. c. 1894) supposes, the species are certainly different.

#### 8. *Chætoceros simile*, Cl. (1896, 5) p. 30, fig. 1.

Pl. IV, fig. 55.

Filaments few-celled, 7—17  $\mu$  wide.

Cells, in a front view, rectangular with sharp angles.

Valves flat with a hump in the middle where they touch one another. Foramina bi-partite, longer than the width of the filaments.

Chromatophores 2, close to the valves.

Setæ straight, stiff, issuing from the angles of the cells in a sagittal direction, crossing one another beyond the margin of the filaments, generally with their entire length lying almost in the sagittal plane, crossing one another at acute angles.

Terminal setæ greatly divergent, thicker than the others, but with the same direction as they.

Spores, according to *Cleve*, in the middle of the parent cells, with almost uniformly convex, spinous valves.

*Period of Vegetation.* Winter and spring.

*Forekomst.* Vestkysten februar 96 (*Nordgaard*), Drøbak februar—marts 96.

*Udbredelse.* Atlanterhavet—Kattegat.

### 9. *Chætoceros didymum*, Ehr. (1845).

Tab. nostr. I, fig. 8—10; T. III, fig. 37, 38.

Syn. *Ch. gastridium*, Ehr. Van Heurck. Synops. T. 82 bis fig. 1, 2.

„ *mamillanum*, Cl. (1889) p. 55.

„ *didymum*, Brightw. (1856) T. VII, fig. 2—7.

„ „ „ Cl. (1894) p. 14, T. I, fig. 3, 4.

Kjederne rette, ikke snoede, mere eller mindre sammentrykte, 11—36  $\mu$  brede.

Cellerne i frontstilling rektangulære med fremspringende, skarpe hjørner og konkave skaller, der i midten bærer en halvkugleformet forhøining, i sidestilling mer eller mindre fladtrykt elliptiske.

Foramina bredt lancetformede med to halvcirkelformede indsnøringer paa midten.

Cellekjernen frontstillet, kromatoforerne 2, trykkede op mod skallerne, hver med sit store pyrenoid, som passer ind i skallens halvkugleformede udbugtning.

Hornene gaar ud fra cellernes hjørner i skraa retning og krydser hverandre ved udgangspunktet eller noget udenfor dette; de udgaar tværs paa længdeaxen og danner indbyrdes en næsten ret vinkel, to tilnærmelsesvis sagittalt, de to andre næsten transversalt. Nær krydsningspunktet er de oftest noget bøiede i retning af filamentets nærmeste ende, ellers temmelig rette. Ved roden af hornene findes ofte en vifteformig bundt af tynde, forkislede traade (T. I, fig. 8).

Terminalhorn differentierede, med budte, spiralstillede forhøjninger, svagt divergerende baade i sagittal og i transversal retning.

Hvilesporer glatte, beliggende helt ensidig med sekundærskallen tæt op til modercellens ene skal og delvis sammenvokset med denne, derved parvis forenede ved modercellernes horn\*). Disse er korte, kraftige, glatte, bøiede eller næsten rette, gaar ud i diagonal retning i sagittalplanet og krydser hverandre under en spids vinkel noget udenfor udgangspunktet.

Sporernes skaller lavt koniske, noget uregelmæssig bugtet hvælvede eller næsten plane, primærskallen (den ydre) oftest noget mere hvælvet end den indre.

Varierer noget efter årstiderne. Som yderformer kan opstilles:

*f. autumnalis*, Gran mscr. T. III, fig. 38.

Cellevæggene temmelig tykke, hornene kraftige, krydsende hinanden lige ved udgangspunktet. Novbr.—februar.

*f. æstiva*, Gran mscr. T. III, fig. 37.

Cellevæggen tynd, hornene svage, krydsende hinanden 3—4  $\mu$  udenfor udgangspunktet, saa at foramina bliver længere end filamentets bredde. Juni—august.

\*) Efter *Cleve* og de tidligere forfatters tegninger ser det ud, som om hornene udgik direkte fra sporens skal. Som fig. 9—10, tab. I viser, er dette ikke tilfældet.

*Occurrence.* W. coast of Norway, Feb. 1896 (*Nordgaard*); Drøbak, Feb. and March 1896.

*Distribution.* Atlantic Ocean, Kattegat.

### 9. *Chætoceros didymum*, Ehr. (1845).

Pl. I, figs. 8—10; Pl. III, figs. 37, 38.

Syn. *Ch. gastridium*, Ehr. Van Heurck Synops. Pl. 82 bis figs. 1, 2.

„ *mamillanum*, Cl. (1889) p. 55.

„ *didymum*, Brightw. (1856) Pl. VII, figs. 2—7.

„ „ „ Cl. (1894) p. 14, Pl. I, figs. 3, 4.

Filaments straight, not twisted, more or less compressed, 11—36  $\mu$  broad.

Cells, in a front view, rectangular, with sharp, projecting angles and concave valves with a hemispherical protuberance in the middle; in a side view, of a more or less flattened elliptical shape.

Foramina broadly lanceolate, with two semicircular constrictions in the middle.

Cell-nucleus in the front, chromatophores 2, pressed up against the valves, each with its large pyrenoid fitting into the hemispherical protuberance of the valve.

Setæ issue from the angles of the cells in an oblique direction, and cross each other at the insertion or rather beyond it; they go out perpendicularly to the long axis, and form mutually almost a right angle, two approximately sagittal, the other two almost transverse. Near the point where they cross, they are generally bent in the direction of the nearest end of the filament, but are otherwise nearly straight. At the root of the setæ, a fan-shaped fascicle of thin, siliceous filaments is often found (Pl. I, fig. 8).

Terminal setæ differentiated, with blunt, spiral prominences, diverging slightly in sagittal and transverse directions.

Spores smooth, quite at one side, with the secondary valve close up to one valve of the parent cell, and partly coalesced with it, thereby being connected in pairs by the setæ of the parent cell\*). These setæ are short, strong, smooth, curved or nearly straight, issue diagonally in the sagittal plane, and cross each other at an acute angle a little beyond the point of issue.

Valves of the spores low conical, rather irregularly convex, or almost flat, the primary (outer) valve generally rather more convex than the inner.

Varies a little according to the time of year. As extreme forms may be named:

*f. autumnalis*, Gran mscr. Pl. III, fig. 38.

Cell walls rather thick, setæ strong, crossing one another close to their insertion. Nov. to Feb.

*f. æstiva*, Gran mscr. Pl. III, fig. 37.

Cell wall thin, setæ weak, crossing one another from 3 to 4  $\mu$  beyond their insertion, so that the foramina are longer than the width of the filament. June to Aug.

\*) From the drawings of *Cleve* and the earlier writers it appears as if the setæ issued from the valve of the spore. As figs. 9 and 10, Pl. I show, this is not the case.



*Vegetationstid.* Især sommer og høst, dog i smaa mængder hele aaret. Sporer i november.

*Forekomst.* Ekersund og Christianiafjord november 93 (*Hjort*), Vestkysten juni 95 (*Hjort*) og juni 96 (*S. Müller*), Bergensfjord juni—august 96 (*Nordgaard*), Vestkysten februar 96 (*Nordgaard*).

*Udbredelse.* Atlanterhavet, Nordsoen, Skagerak, Kattegat.

**10. *Chætoceros laciniosum*, Schütt (1895) p. 38,**  
fig. 5 a—c.

Tab. I, fig. 4—7.

Syn. *Ch. distans*, Cl. (1894) p. 14, T. II, fig. 2 (non 1873).  
.. *breve*, Schütt (1895) p. 38, fig. 4 a, b.  
.. *distans*, Gran in *Hjort* (1895) p. 40—41.  
.. *commutation*, Cl. (1896, 5) p. 28, fig. 9—10.

Rette, ikke eller svagt snoede kjeder, bredde 10—42  $\mu$ . Cellerne i frontstilling rektangulære med kort fremspringende, udvendig afrundede hjørner, i sidestilling elliptiske. Skallerne konkave, paa midten lavt hvælvede. Foramina rektangulære-kvadratiske med afrundede hjørner, svagt indsnørede paa midten. Baandet langt cylindrisk, mindst  $\frac{1}{3}$  af cellens længde (1).

Kromatoforer 1—2, liggende op til den ene eller til begge skaller, uregelmæssig lappede eller næsten hele.

Hornene tynde, boiede, udgaar fra skallerens indboiede hjørner næsten parallelt med kjedens længdeaxe indtil krydsningspunktet, boier saa af næsten tværs paa denne, divergerende under en ret vinkel, to parallelt sagittalaxen, de to andre næsten transversalt til hver sin side af sagittalplanet.

Terminalhorn differentierede, paa midten noget fortykkede, med afrundede, spiralstillede forhøininger, i frontstilling næsten parallele, i sagittalstilling divergerende i en spids vinkel.

Hvilesporer glatte, beliggende noget ensidig i modercellerne med undersiden vendt mod modercellens nærmeste skal. Primærskallen hoit pukkelformig hvælvet, sekundærskallen næsten plan, svagt hvælvet paa midten.

*Vegetationstid.* Hele aaret, især vinter og vaar. Sporer i marts—juni.

*Forekomst.* Vestkysten og Christianiafjorden november 93 (*Hjort*), Marstenen juni 95 (*Hjort*), Vestkysten februar 96 (*Nordgaard*), Drøbak februar—marts 96! Trondhjem juni 96 (*S. Müller*).

*Udbredelse.* Nordsoen, Skagerak, Kattegat, Østersøen.

**II. *Chætoceros constrictum*, n. sp.**

Tab. I, fig. 11—13; Tab. III, fig. 42.

Kjederne rette, ikke snoede, bredde 14—35  $\mu$ .

Cellerne i frontstilling rektangulære med skarpe, kort fremspringende hjørner og temmelig dybe indsnøringer ved sømmene, i sidestilling elliptiske—cirkulære. Skallerne kon-

*Period of Vegetation.* Especially summer and autumn, although in small quantities the whole year. Spores in November.

*Occurrence.* Ekersund and Christiania Fjord, Nov. 1893 (*Hjort*); W. coast of Norway, June 1895 (*Hjort*) and June 1896 (*S. Müller*); Bergen Fjord, June to Aug. 1896 (*Nordgaard*); W. coast of Norway, Feb. 1896 (*Nordgaard*).

*Distribution.* Atlantic Ocean, North Sea, Skagerak, Kattegat.

**10. *Chætoceros laciniosum*, Schütt (1895) p. 38,**  
figs. 5 a—c.

Pl. I, figs. 4—7.

Syn. *Ch. distans*, Cl. (1894) p. 14, Pl. II, fig. 2 (not 1873).  
.. *breve*, Schütt (1895) p. 38, fig. 4 a, b.  
.. *distans*, Gran in *Hjort* (1895) pp. 40, 41.  
.. *commutation*, Cl. (1896, 5) p. 28, figs. 9, 10.

Filaments straight, only slightly, if at all twisted, width 10—42  $\mu$ . Cells, in a front view, rectangular with shortly projecting, outwardly rounded angles; in a side view, elliptical. Valves concave, slightly convex in the middle. Foramina rectangular to square, with rounded corners, slightly constricted in the middle. Hoop long cylindrical, at least  $\frac{1}{3}$  of the length of the cell (1).

Chromatophores 1 or 2 lying close to one valve, or one to each valve, irregularly lobed or almost entire.

Setæ thin, curved, issuing from the incurved angles of the valves almost parallel with the long axis of the filament, as far as the point of crossing, then turning off almost perpendicularly to it, diverging at a right angle, two parallel to the sagittal axis, the other two almost transversely to opposite sides of the sagittal plane.

Terminal setæ differentiated, somewhat thickened in the middle, with rounded, spiral prominences, almost parallel in a front view, in a sagittal view diverging at an acute angle.

Spores smooth, situated rather at one side in the parent cells, with the under surface turned towards their nearest valve. Primary valve with a high hump, secondary valve almost flat, slightly convex in the middle.

*Period of Vegetation.* The whole year, especially winter and spring. Spores from March to June.

*Occurrence.* W. coast of Norway and Christiania Fjord, Nov. 1893 (*Hjort*); Marstenen, June 1895 (*Hjort*); W. coast of Norway, Feb. 1896 (*Nordgaard*); Drøbak, Feb. and March 1896; Trondhjem, June 1896 (*S. Müller*).

*Distribution.* North Sea, Skagerak, Kattegat, Baltic.

**II. *Chætoceros constrictum*, n. sp.**

Pl. I, figs. 11—13; Pl. III, fig. 42.

Filaments straight, not twisted, 14—35  $\mu$  wide.

Cells, in a front view, rectangular, with sharp, slightly projecting angles, and rather deep constrictions at the sutures; in a side view, elliptical to circular. Valves con-



kave, foramina lancetformede—spalteformede. Baandcylinderens længde mindst  $\frac{1}{3}$  af cellens.

Kromatoforer 2, pladeformede, liggende op mod skallerne. Hornene er temmelig tynde, noget bøiede, udgaar fra skallerens hjørner og krydser hverandre ved udgangspunktet; derefter gaar to sagittalt, to næsten transversalt til hver sin side af sagittalplanet.

Terminalhorn ved grunden bøiede, forøvrigt næsten rette, svagt fortykkede paa midten, forsynede med afrundede, spiralstillede tænder, divergerende i en spids vinkel saavel i frontstilling som i sagittalstilling.

Hvilesporer midt i modercellerne, begge skaller med korte, ugrenede torne, primærskallen mere eller mindre høit buetformig hvalvet, sekundærskallen oftest noget fladere med en pukkel paa midten.

*Vegetationstil.* Hele aaret, især vinter og vaar.

*Forekomst.* Vestkysten og Christianiafjorden november 93 (*Hjort*), Marstenen juni 95 (*Hjort*), Vestkysten februar 96 (*Nordgaard*), Christianiafjord januar—april 96! Atlanterhavet mai 96 (*Bie*), Drøbak august 96 (Frk. *Bonnevie*).

*Udbredelse.* Atlanterhavet, Nordsøen, Skagerak.

*Ch. constrictum* er meget nær beslegtet med den japanesiske art, som er afbildet i *Van Heurck* Synopsis T. 82 bis, fig. 3 under navn af *Ch. Ralfsii*, Cl. Denne art, som jeg foreslaar at kalde *Ch. Vanheurckii* n. sp. er dog meget forskjellig fra den ægte *Ch. Ralfsii*; *Cleve*'s tegning og beskrivelse (1873, 11) p. 10, T. III, fig. 15 viser, at denne tilhører samme gruppe som *Ch. affine*, *Lauder* (1864) p. 78, T. VIII, fig. 5 og *Ch. Schüttii*, Cl., hvilke begge karakteriseres ved sterkt divergerende, krumme terminalhorn, meget lav baandcylinder og hvilesporer, hvor sekundærskallen er sterkere bevæbnet end den primære.

I et præparat fra Japan (Cl. M. a Diat. 307), som *Cleve* velvillig har tilsendt mig, har jeg fundet baade *Ch. Vanheurckii* og en form, som jeg har henført til den ægte *Ch. Ralfsii*, Cl. Den er afbildet med hvilespore paa tab. II, fig. 21. Den ligner *Ch. Schüttii* og *Ch. affine* med hensyn paa hornenes retning og cellernes form, men har karakteristiske hvilesporer med butte, vorteformede processer paa begge skaller, størst paa den sekundære, og en krans af fine punkter langs primærskallens nedre rand.

*Ch. Vanheurckii* adskiller sig fra *Ch. constrictum* ved tykkere terminalhorn og ved hvilesporerne, som har en tæt krans af jevnhøie, nedadrettede naale langs primærskallens nedre rand. Dens diagnose bliver som følger:

*Chaetoceros Vanheurckii* n. sp. Cl. M. a Diat. 307.

Syn. *Ch. Ralfsii*, V. H. Synops. T. LXXXII bis fig. 3, non Cl.

*Ch. filamentis rectis, cellulis a fronte visis rectangularibus in suturis constrictis, valvis concavis, foraminibus*

cave, foramina varying from lanceolate to linear. Length of the hoop cylinder at least  $\frac{1}{3}$  that of the cell.

Chromatophores 2, lamelliform, lying close to the valves. Setæ rather thin, somewhat curved, issuing from the corners of the valves, and crossing one another at the insertion; two of them then proceed in a sagittal direction, two almost transversally to opposite sides of the sagittal plane.

Terminal setæ curved at the base, otherwise nearly straight, slightly thickened in the middle, furnished with rounded, spirally-arranged denticles, diverging at an acute angle, both in a front and in a sagittal view.

Spores in the middle of the parent cells, both valves with short, unramified spines; primary valve more or less arcuate, secondary valve generally rather flatter with a hump in the middle.

*Period of Vegetation.* The whole year, especially winter and spring.

*Occurrence.* W. coast of Norway and Christiania Fjord, Nov. 1893 (*Hjort*); Marstenen, June 1895 (*Hjort*); W. coast of Norway, Feb. 1896 (*Nordgaard*); Christiania Fjord, Jan. to April 1896; Atlantic, May 1896 (*Bie*); Drøbak, Aug. 1896 (*Miss Bonnevie*).

*Distribution.* Atlantic Ocean, North Sea, Skagerak.

*Ch. constrictum* is very nearly allied to the Japanese species figured in *Van Heurck's* Synopsis, Pl. 82 bis, fig. 3, under the name of *Ch. Ralfsii*, Cl. This species however, which I suggest should be called *Ch. Vanheurckii* n. sp., is very different from the true *Ch. Ralfsii*. *Cleve's* illustration and description (1873, 11) p. 10, Pl. III, fig. 15, show that the latter belongs to the same group as *Ch. affine*, *Lauder* (1864) p. 78, Pl. VIII, fig. 5 and *Ch. Schüttii*, Cl. which are both characterised by greatly diverging, curved terminal setæ, very short hoopcylinder and spores in which the secondary valve is more fully armed than the primary.

In a preparation from Japan (Cl. M. a Diat. 307), which *Cleve* kindly sent me, I have found both *Ch. Vanheurckii* and a form which I have referred to the true *Ch. Ralfsii*, Cl. It is figured with spores on Pl. II, fig. 21. It resembles *Ch. Schüttii* and *Ch. affine* with regard to the direction of the setæ and the shape of the cells, but has characteristic spores with blunt, wart-like processes on both valves — largest on the secondary valve — and a wreath of minute puncta along the lower margin of the primary valve.

*Ch. Vanheurckii* differs from *Ch. constrictum* in the thicker terminal setæ, and its spores, which have a close wreath of downward-pointed spicula of uniform length along the inferior margin of the primary valve. Its diagnosis is as follows:

*Chaetoceros Vanheurckii* n. sp. Cl. M. a Diat. 307.

Syn. *Ch. Ralfsii*, V. H. Synops. Pl. LXXXII bis, fig. 3, non Cl.

*Ch. filamentis rectis, cellulis a fronte visis rectangularibus in suturis constrictis, valvis concavis, foraminibus*

*lanceolatis, setis ex angulo extremo exeuntibus radice brevissime concretis, divergentibus, setis terminalibus crassis, admodum rectis, acute spinulosis, angulo acuto divergentibus, sporarum valvis subaequaliter spinosis, primaria in margine inferiore aculeis aequilongis parallelis coronata.*

Japan (Jeddo Bay).

**12. Chætoceros Schüttii**, Cl. (1894) p. 14, T. I, fig. 1.

Fig. Schütt (1888) T. III, fig. II, III.

Tab. nostr. II, fig. 19, 20.

Syn. *Ch. procerum*, Schütt (1895) p. 38, fig. 3 a, b (?)

Kjederne rette, 9—22  $\mu$  brede.

Cellerne i frontstilling rektangulære med skarpe hjørner, skallerne noget konkave med en svag hvælving paa midten, foramina bredt spalteformede, indsnævrede paa midten. Baand meget lavt cylindrisk, mindre end  $\frac{1}{4}$  af cellelængden.

Kromatofoer 1 i hver celle, frontstillet.

Hornene rette, udgaar fra skallernes hjørner og krydses lige ved udgangspunktet, divergerer en spids vinkel og afbøies lidet eller intet mod filamentets ender.

Terminalhorn divergerende en stump vinkel, sterke, fortykkede paa midten, svagt snoede med en aaben spiral af forhoiede punkter, ofte sterkt bøiede i longitudinal retning lidt udenfor midten.

Sporerne midt i modercellerne, primærskallen buformig hvælvet med korte, sterkt divergerende torne paa næsten hele fladen, sekundærskallen puklet med længere, svagt divergerende torne kun paa den midtre del.

*Vegetationstid.* August—November, med sporer.

*Forekomst.* Ekersund og Christianiafjorden november 93 (*Hjort*), Drøbak august (frk. *Bonnerie*) og september 96.

*Udbredelse.* Skagerak, Kattegat, Østersøen.

*Ch. Schüttii* er meget nær beslegtet med *Ch. affine*, Launder, fra hvilken den maaske vanskelig kan skilles.

**13. Chætoceros Willei**, n. sp.

Tab. IV, fig. 47.

Kjederne rette, bredde 10—20  $\mu$ .

Cellerne i frontstilling rektangulære-kvadratiske med skarpe hjørner, skallerne næsten plane, foramina linjeformede, svagt indsnørede paa midten. Baandcylinderen forlænget, sammene tydelige.

Chromatofoer 1, frontstillet.

Hornene tynde, rette, udgaende fra skallernes hjørner og krydsende hverandre ved udgangspunkterne, divergerende en spids vinkel, svagt eller slet ikke afbøiede mod filamentets ender. Terminalhorn kortere, svagt fortykkede paa midten, divergerende i en spids vinkel.

Hvilesporer ukjendte.

*lanceolatis, setis ex angulo extremo exeuntibus radice brevissime concretis, divergentibus, setis terminalibus crassis, admodum rectis, acute spinulosis, angulo acuto divergentibus, sporarum valvis subaequaliter spinosis, primaria in margine inferiore aculeis aequilongis parallelis coronata.*

Japan (Jeddo Bay).

**12. Chætoceros Schüttii**, Cl. (1894) p. 14, Pl. I, fig. 1.

Fig. Schütt (1888) Pl. III, fig. II, III.

Pl. II, figs. 19, 20.

Syn. *Ch. procerum*, Schütt (1895) p. 38, fig. 3 a, b (?)

Filaments straight, 9—22  $\mu$  wide.

Cells, in a front view, rectangular with sharp angles, valves somewhat concave with a slight convexity in the middle; foramina broadly linear, narrowed in the middle. Hoop very short cylindrical, less than  $\frac{1}{4}$  of the length of the cell.

Chromatophores, one in each cell, situated in front.

Setae straight, issuing from the corners of the valves, and crossing one another close to the point of issue; they diverge at an acute angle, and are little, if at all turned off towards the ends of the filament.

Terminal setae diverging at an obtuse angle, strong, thickening in the middle, slightly twisted with an open spiral of raised puncta, often much curved in a longitudinal direction a little beyond the middle.

Spores in the middle of the parent cells, primary valve arcuate with short, sharply-diverging spines over nearly the whole surface; secondary valve humped, with longer, slightly-diverging spines only in the middle.

*Period of Vegetation.* From August to November with spores.

*Occurrence.* Ekersund and Christiania Fjord, Nov. 1893 (*Hjort*); Drøbak, Aug. (*Miss Bonnerie*) and Sept. 1896.

*Distribution.* Skagerak, Kattegat, Baltic.

*Ch. Schüttii* is very nearly allied to *Ch. affine*, Launder, from which it may perhaps be difficult to distinguish it.

**13. Chætoceros Willei**, n. sp.

Pl. IV, fig. 47.

Filaments straight, 10—20  $\mu$  broad.

Cells, in a front view, rectangular to square, with sharp angles, valves almost flat, foramina linear, slightly constricted in the middle. Hoop cylinder long, sutures indistinct.

Chromatophore, 1, in front.

Setae thin, straight, issuing from the angles of the valves, and crossing each other at their insertion, diverging at an acute angle, only slightly, if at all curved towards the ends of the filament. Terminal setae shorter, slightly thickened in the middle, diverging at an acute angle.

Spores unknown.



*Vegetationstid.* Sommer.

*Forekomst.* Marstenen juni 95 (*Hjort*), vestkysten juni 96 (*S. Müller*), Bergensfjorden juni—august 95 (*Nordgaard*).

*Udbredelse.* Nordsøen.

Fra *Ch. Schüttii* adskilles denne art ved de svagt divergerende terminalhorn, den lange baandcylinder og de smelere foramina.

#### 14. *Chætoceros diadema*, (Ehr.) Gran mscr.

Tab. nostr. II, fig. 16—18.

Syn. *Syndendrium diadema*, Ehr. (1854) T. 35, A. XVIII, 13.

— — —, Bail. (1856) T. I, fig. 24, 25.

— — —, Brightw. (1856) T. VII, fig. 49—52.

*Chætoceros sp. indet.* Schütt (1888) T. III, fig. VI.

— *paradoxum*, Cl. var. *subsecunda*, Grun. in Van Heurck Synops. T. 82 bis, fig. 6.

— — — var. *Lüdersii*, Engl. (1883) p. XI.

— — — Schütt (1895) p. 37.

— *Clevei*, Schütt (1895) p. 40, fig. 8 a, b.

— *grænlandicum*, Cl. (1896, 4) p. 7, T. II, fig. 3—5.

*curvisetum*, Cl. (1894) *pro parte* (?) (1896, 5) p. 29, fig. 12.

Kjederne rette, undertiden svagt snoede, bredde 11—46  $\mu$ . Cellerne i frontstilling rektangulære med afrundede hjørner, skallerne svagt konvekse, foramina udtrukket af-lange, svagt og jævnt indsnorede mod midten. Baandets højde variabel, mindst  $\frac{1}{4}$  af cellelængden (*l*).

Kromatofor 1, pladeformet, frontstillet.

Hornene rette, udgaar lidt indenfor skallernes hjørner i skraa retning, krydses lidt udenfor udgangspunkterne i højde med cellens ydre rand eller lidt udenfor denne, bøier derefter skarpt af, to i sagittal, to i transversal retning, de sidste til hver sin side af sagittalplanet.

Terminalhornene noget fortykkede paa midten, spidsvinklet divergerende.

Sporerne noget ensidig i modercellerne, med sekundærskallen vendt mod modercellens nærmeste skal. Skallerne i de smale kjeder hoit buetformig hvalvede, i de bredere næsten flade, mere eller mindre tydelig puklede paa midten. Primærskallen, som ofte er lidt sterkere hvalvet, bærer 4—12 rette, dikotomisk forgrenede horn, der i almindelighed naar lige til modercellens skal og stanses i sin vækst af denne. Hornenes grene danner stumpe vinkler med hverandre.

*Vegetationstid.* Hele aaret, ved vore kyster især vinter og vaar. Sporer i marts—juni.

*Forekomst.* Vestkysten og Christianiafjorden november 93 (*Hjort*), Marstenen juni 95 (*Hjort*), Stavanger—Bergen februar 96 (*Nordgaard*), Drøbak februar—marts 96! Lofoten marts—april 96 (*Nordgaard*), Atlanterhavet mai 96 (*Bie*), vestkysten juni 96 (*S. Müller*), Bergensfjorden juni juli 96 (*Nordgaard*).

*Period of Vegetation.* Summer.

*Occurrence.* Marstenen, June 1895 (*Hjort*); W.coast of Norway, June 1896 (*S. Müller*); Bergen Fjord, June to Aug. 1896 (*Nordgaard*).

*Distribution.* North Sea.

This species is distinguished from *Ch. Schüttii* by the slightly divergent terminal setæ, the long hoopcylinder, and the narrower foramina.

#### 14. *Chætoceros diadema*, (Ehr.) Gran mscr.

Pl. II, figs. 16—18.

Syn. *Syndendrium diadema*, Ehr. (1854) Pl. 35, A. XVIII, 13.

— — —, Bail. (1856) Pl. I, figs. 24, 25.

— — —, Brightw. (1856) Pl. VII, figs. 49—52.

*Chætoceros sp. indet.* Schütt (1888) Pl. III, fig. VI.

— *paradoxum* Cl. var. *subsecunda*, Grun. in Van Heurck Synops. Pl. 82 bis, fig. 6.

— — — var. *Lüdersii*, Engl. (1883) p. XI.

— — — Schütt (1895) p. 37.

— *Clevei*, Schütt (1895) p. 40, fig. 8 a, b.

— *grænlandicum*, Cl. (1896, 4) p. 7, Pl. II, figs. 3—5.

— *curvisetum*, Cl. (1894) *pro parte* (?) (1896, 5) p. 29, fig. 12.

Filaments straight, sometimes slightly twisted, 11—46  $\mu$  wide. Cells, in a front view, rectangular with rounded angles, valves slightly convex, foramina elongated oblong, slightly and evenly constricted towards the middle. Height of hoop, variable, at least  $\frac{1}{4}$  of the length of the cell (*l*).

Chromatophore, 1, lamelliform, in front.

Setæ straight, issuing a little within the angles of the valves in an oblique direction, crossing a little beyond their insertion on a level with, or a little beyond the outer margin of the cell, then turning sharply off, two in a sagittal, two in a transverse direction, the latter to opposite sides of the sagittal plane.

Terminal setæ rather thickened in the middle, diverging at an acute angle.

Spores somewhat at one side in the parent cells, with the secondary valve turned towards the nearest valve of the parent cell. Valves in the narrow filaments very arcuate, in the broader ones almost flat, with a more or less distinct hump in the middle. Primary valve, which is often a little more vaulted, carries from 4 to 12 straight, dichotomously ramified setæ, generally reaching as far as the valve of the parent cell, which arrests their further growth. The rami of the setæ form obtuse angles with one another.

*Period of Vegetation.* The whole year, on our (Norw.) coasts especially winter and spring. Spores from March to June.

*Occurrence.* W.coast of Norway and Christiania Fjord, Nov. 1893 (*Hjort*); Marstenen, June 1895 (*Hjort*); Stavanger to Bergen, Feb. 1896 (*Nordgaard*); Drøbak, Feb. and March 1896; Lofoten, March and April 1896 (*Nordgaard*); Atlantic Ocean, May 1896 (*Bie*); W.coast of Norway, June 1896 (*S. Müller*); Bergen Fjord, June and July 1896 (*Nordgaard*).



*Udbredelse.* Atlanterhavet—Østersøen (Engler, Schütt), Baffins Bay (Cleve), Kamtschatka (Bailey), Japan (Cleve). Sandsynligvis i alle have.

Den art, som findes ved vore kyster, og som Cleve nylig (1896, 4, p. 7) har beskrevet under navn af *Ch. grønlandicum*, er uden tvil identisk med *Ch. (paradoxum, Cl. β) subsecundum*, Grun. fra Japan (Cl. M. a. Diat. 307) og med de af Bailey afbildede sporer (*Syndendrium diadema*) fra Kamtschatka. Da nu hvilesporerne er kjendte hos et temmelig stort antal arter, og *Ch. subsecundum*, Grun. i alle tilfælde har en meget vid udbredelse, har jeg ingen tvil om, at alle eller de fleste hvilesporer, som er beskrevne under navnet *Syndendrium diadema*, tilhører denne art. (Brightwells tegninger er dog noget afvigende ved den mindre vinkel mellem tornenes grene).

Jeg har nemlig ved vore kyster fundet et særdeles stort antal eksemplarer af denne art med sporer, og jeg har iagttaget, at sporerne varierer overordentlig med hensyn paa skallernes hvælving og tornenes antal, ligesom jo ogsaa kjedens bredde er meget variabel. Denne art, som ved siden af *Ch. boreale*, *Ch. decipiens* og *Ch. sociale* hører til de mest udbredte arter, er ogsaa af dem, som varierer mest.

Derfor har jeg fundet at maatte optage Ehrenbergs navn istedenfor *Ch. subsecundum*, Grun. eller de endnu nyere navne *Ch. Lüdersii*, Engl., *Ch. Clevei*, Schütt og *Ch. grønlandicum*, Cleve.

*Distribution.* Atlantic, Baltic (Engler, Schütt), Baffin's Bay (Cleve), Kamtschatka (Bailey), Japan (Cleve). Probably in all seas.

The species found on our (Norw.) coasts, and which Cleve has lately (1896, 4, p. 7) described under the name of *Ch. grønlandicum*, is undoubtedly identical with *Ch. (paradoxum Cl. β) subsecundum*, Grun. from Japan (Cl. M. a. Diat. 307), and with the spores from Kamtschatka (*Syndendrium diadema*) figured by Bailey. As spores are found in rather a large number of species, and *Ch. subsecundum*, Grun. in any case has a very wide distribution, I have no doubt that all or most of the spores described under the name of *Syndendrium diadema*, belong to this species. (Brightwell's drawings, however, differ somewhat in the smaller angle between the rami of the spines).

On our coasts (Norway), I have found a particularly large number of specimens of this species with spores, and I have observed that the spores vary exceedingly as regards the convexity of the valves and the number of the spines, the width of the filament also being very variable. This species, which, like *Ch. boreale*, *Ch. decipiens* and *Ch. sociale*, is one of the most widely distributed, is also one of those which vary most.

I have therefore thought it necessary to adopt Ehrenberg's name instead of *Ch. subsecundum*, Grun., or the still newer names *Ch. Lüdersii*, Engl., *Ch. Clevei* Schütt and *Ch. grønlandicum*, Cleve.

### 15. *Chætoceros seiracanthum* n. sp.

Tab. III, fig. 39—41.

Kjederne rette, ei snoede, bredde 12—24  $\mu$ .

Cellerne i frontstilling rektangulære med svagt frem-springende, udvendig afrundede hjørner. Skallerne svagt konkave, foramina rektangulære med afrundede hjørner.

Kromatofor 1. frontstillet.

Hornene tynde, svagt bøiede, udgaaende fra skalhjørnernes inderside i skraa retning, krydsende hverandre noget udenfor udgangspunkterne i høide med cellens ydre rand, derefter afbøiede i sagittal og transversal retning, de transversale horn til hver sin side af sagittalplanet.

Terminalhorn svagt fortykkede paa midten, spidsvinklet divergerende.

Sporerne midt i modercellerne, begge skallerne omtrent ens puklet hvælvede eller den øvre (primære) buetformig hvælvet, begge med lange rette torne, som radierer i alle retninger. Den primære skal bærer desuden langs sin nedre kant en krans af nedadrettede, ligelange, rette, tynde, parallelle naale.

*Vegetationstid.* I november med sporer.

*Forekomst.* Christianiafjorden (*Hjort*) og Gullmarsfjorden, Bohuslän (Cleve) november 1893.

*Udbredelse.* Skagerak?

### 15. *Chætoceros seiracanthum* n. sp.

Pl. III, figs. 39—41.

Filaments straight, not twisted, 12—24  $\mu$  wide.

Cells, in a front view, rectangular with slightly projecting, exteriorly rounded angles. Valves slightly concave, foramina rectangular with rounded angles.

Chromatophore 1, in front.

Setæ thin, slightly curved, issuing in an oblique direction from the interior surface of the angles of the valves, crossing one another a little beyond their insertion, on a level with the outer margin of the cell, then turning off in sagittal and transverse directions, the transverse setæ to opposite sides of the sagittal plane.

Terminal setæ slightly thickened in the middle, diverging at an acute angle.

Spores in the middle of the parent cells, the humps on the two valves being about equal, or the upper (primary) valve arcuate, both with long straight spines radiating in all directions. The primary valve also carries along its inferior margin a wreath of downward-pointing, uniformly long, straight, thin, parallel apiculi.

*Period of Vegetation.* In November with spores.

*Occurrence.* Christiania Fjord (*Hjort*) and Gullmars Fjord, Bohuslän (Cleve), Nov. 1893.

*Distribution.* Skagerak(?)

I steril tilstand vanskelig at skille fra spædere former af *Ch. diadema*.

**16. *Chætoceros crinitum*, Schütt (1895) p. 42, fig. 12 a—d.**  
Tab. IV, fig. 51.

Kjederne rette, 12—29  $\mu$  brede.

Cellerne i frontstilling rektangulære med afrundede eller afskaarne hjørner, skallerne plane, foramina spalteformede eller manglende.

Kromatofo 1, frontstillet.

Hornene tynde, lange, bøiede i forskellige retninger, udgaaende fra den indre side af de afrundede hjørner og krydsende hverandre lige ved udgangspunktet. Terminalhorn bøiede, lidet differentierede.

Hvilesporer ukjendte.

*Vegetationstid.* Vinter og vaar.

*Forekomst.* Drøbak, marts 1896.

*Udbredelse.* Skagerak—Østersøen.

**17. *Chætoceros coronatum*, n. sp.**

Tab. II, fig. 28—31.

Kjederne rette, bredde 14—29  $\mu$ .

Cellerne i frontstilling rektangulære med skarpe, noget fremspringende hjørner. Skallerne konkave, foramina lancetformede. Baandet temmelig langt cylindrisk, mindst  $\frac{1}{3}$  af cellelængden. Sommen lidet tydelige.

Kromatofo 1, frontstillet.

Hornene tynde, rette, gaaende ud fra skallernes hjørner, krydsende hverandre lige ved udgangspunktet, divergerende en stump vinkel, de transversale horn til modsat side af sagittalplanet.

Sporerne omtrent midt i modercellerne, primærskallen glat, buetformig hvælvet med en krans af rette, parallelle naale langs den øvre rand, sekundærskallen glat, pukkelformig hvælvet.

*Vegetationstid.* Med sporer i november.

*Forekomst.* Ekersund og Christianiafjorden (*Hjort*) og i Gullmarsfjorden, Bohuslän (*Cleve*), november 1893.

*Udbredelse.* Skagerak—Nordsøen, Østersøen (Kiel, *Apstein*).

**18. *Chætoceros curvisetum*, Cl. (1889) p. 55.**

Tab. nostr. II, fig. 22; III, fig. 43.

Syn. *Chætoceros* sp. *indet.*, Schütt (1889), T. XIV, fig. 1—7.

— *secundum*, Schütt (1893) p. 25.

— *curvisetum*, Cl. (1894) p. 12, T. I, fig. 5.

— *cochlea*, Schütt (1895) p. 41, fig. 11.

Kjederne spiralformig bøiede, 10—29  $\mu$  brede.

Cellerne i frontstilling rektangulære med sterkt fremspringende hjørner, skallerne konkave, foramina cirkulære, ovale eller afrundet rhombiske. Baandet langt cylindrisk.

Kromatofo 1, frontstillet.

In a sterile condition, it is difficult to distinguish from the more slender forms of *Ch. diadema*.

**16. *Chætoceros crinitum*, Schütt (1895) p. 42, fig. 12 a—d.**  
Pl. IV, fig. 51.

Filaments straight, 12—29  $\mu$  wide.

Cells, in a front view rectangular, with rounded or truncated angles, valves flat, foramina linear or absent.

Chromatophore, 1, in front.

Setæ thin, long, curving in various directions, issuing from the inner side of the rounded angles, and crossing one another close to their insertion. Terminal setæ curved, not greatly differentiated.

Spores unknown.

*Period of Vegetation.* Winter and spring.

*Occurrence.* Drøbak, March 1896.

*Distribution.* Skagerak, Baltic.

**17. *Chætoceros coronatum*, n. sp.**

Pl. II, figs. 28—31.

Filaments straight, 14—29  $\mu$  wide.

Cells, in a front view, rectangular with sharp, somewhat projecting angles. Valves concave, foramina lanceolate. Hoop rather long cylindrical, at least  $\frac{1}{3}$  of the length of the cell. Suture not very distinct.

Chromatophore, 1, in front.

Setæ thin, straight, issuing from the angles of the valves, crossing one another close to their insertion, diverging at an obtuse angle, the transversal setæ to the opposite side of the sagittal plane.

Spores about in the middle of the parent cells, primary valve smooth, arcuate, with a wreath of straight parallel spicula along the superior margin, secondary valve smooth, humped.

*Period of Vegetation.* With spores in November.

*Occurrence.* Ekersund and Christiania Fjord (*Hjort*), and Gullmars Fjord, Bohuslän (*Cleve*), Nov. 1893.

*Distribution.* Skagerak, North Sea, Baltic (Kiel, *Apstein*).

**18. *Chætoceros curvisetum*, Cl. (1889) p. 55.**

Pl. II, fig. 22; III, fig. 43.

Syn. *Chætoceros* sp. *indet.*, Schütt (1889) Pl. XIV, figs. 1—7.

— *secundum*, Schütt (1893) p. 25.

*curvisetum*, Cl. (1894) p. 12, Pl. I, fig. 5.

*cochlea*, Schütt (1895) p. 41, fig. 11.

Filaments spirally curved, 10—29  $\mu$  broad.

Cells, in a front view, rectangular with sharply projecting angles, valves concave, foramina circular, oval or of a rounded rhombic shape. Hoop long cylindrical.

Chromatophore, 1, in front.



Hornene gaar ud fra cellernes hjørner og krydses ved udgangspunktet; de er temmelig tykke, bøiede, alle til samme side af sagittalplanet, rettede ud fra kjedens bøjningsaxe. Terminalhorn hverken i form eller retning forskellige fra de øvrige.\*)

Hvilesporer glatte, beliggende næsten midt i modercellerne; skallerne lige høit hvælvede, afrundet koniske. Primærskallen med en ring af punkter langs den øvre rand, sammenvokset med modercellens baand, som ved sporedannelsen fortykkes og danner en kappe paa sporens overside.

*Vegetationstid.* Hele aaret, især sommer og høst. Hvilesporer i august—november.

*Forekomst.* Vestkysten og Christianiafjorden november 1893 (*Hjort*), Marstenen juni 95 (*Hjort*), vestkysten (*Nordgaard*) og ved Drøbak! februar 96, Bergensfjord juni—august 96 (*Nordgaard*), Drøbak august (frk. *Bonnerie*) og september! 96.

*Udbredelse.* Atlanterhavet—Østersøen.

#### 19. *Chætoceros debile*, Cl. (1894) p. 13, Pl. I, fig. 2.

Tab. nostr. II, fig. 14—15.

Østrup 1895, p. 456, T. VII, fig. 89.

Syn. *Ch. vermiculus*, Schütt (1895) p. 39, fig. 7 a—c.

Kjederne spiralformig bøiede, 12—39  $\mu$  brede.

Cellerne i frontstilling rektangulære med afrundede hjørner, skallerne plane eller svagt konvekse, foramina afrundet rektangulære, noget indsnørede paa midten.

Kromatofor 1, frontstillet.

Hornene tynde, bøiede, gaende ud lidt indenfor skallerne i skraa retning, krydsende hverandre ovenfor udgangspunktet i hoide med kjedens rand, derefter afbøiede to transversalt til samme side af sagittalplanet, de to andre sagittalt med en svag bøjning i samme transversalretning, alle bøiede ud fra kjedens bøjningsaxe. Terminalhorn ikke forskellige fra de øvrige.

Hvilesporer midt i modercellerne, begge skaller ens hvælvede, glatte, uregelmæssig topuklede. Primærskallen bærer to enkle, butte horn, som gaar ud noget indenfor randen diagonalt omtrent i retning af modercellens hjørner.

*Vegetationstid.* Hele aaret. Hvilesporer i marts—juni.

*Forekomst.* Nordhavsexp. st. 296, Christianiafjorden—Vestkysten november 93 (*Hjort*), Marstenen juni 95 (*Hjort*), Vestkysten februar 96 (*Nordgaard*), Drøbak fe-

\*) *Cleve* beskriver og afbilder (l. c. 1889, 1891) terminalhorn af en anden form og retning; dette beror dog sandsynligvis paa en sammenblanding af denne art med *Ch. diadema* eller *Ch. constrictum*, hvilke begge forekommer i hans materiale fra Gullmarsfjord. Men begge disse arter har transversalhornene rettede til modsat side af sagittalplanet.

Setæ issue from the angles of the cells and cross at their insertion; they are rather thick, all curved towards the same side of the sagittal plane, directed out from the axis of the filament's curve. Terminal setæ not different from the others either in shape or direction.\*)

Spores smooth, situated almost in the middle of the parent cells; valves equally convex, conically rounded. Primary valve with a ring of puncta along its superior margin, coalesced with the hoop of the parent cell, which is thickened by the spore-formation, and forms a mantle upon the upper surface of the spore.

*Period of Vegetation.* The whole year, especially summer and autumn. Spores from Aug. to Nov.

*Occurrence.* W.coast of Norway and Christiania Fjord, Nov. 1893 (*Hjort*); Marstenen, June 1895 (*Hjort*); W.coast of Norway (*Nordgaard*) and Drøbak, Feb. 1896; Bergen Fjord, June to Aug. 1896 (*Nordgaard*); Drøbak, Aug. (Miss *Bonnerie*) and Sept. 1896.

*Distribution.* Atlantic, Baltic.

#### 19. *Chætoceros debile*, Cl. (1894) p. 13, Pl. I, fig. 2.

Pl. II, figs. 14, 15.

Østrup 1895, p. 457, Pl. VII, fig. 89.

Syn. *Ch. vermiculus*, Schütt (1895) p. 39, fig. 7 a—c.

Filaments spirally curved, 12—39  $\mu$  wide.

Cells, in a front view, rectangular with rounded angles, valves flat or slightly convex, foramina rounded rectangular, somewhat constricted in the middle.

Chromatophore, 1, in front.

Setæ thin, curved, issuing in an oblique direction from a little within the angles of the valves, crossing one another above their insertion on a level with the margin of the filament, then turning off, two transversely to the same side of the sagittal plane, the other two sagittally with a slight curve in the same transverse direction, all bending away from the axis of the chain's curvature. Terminal setæ not differing from the others.

Spores in the middle of the parent cells, valves equally convex, smooth, each with 2 irregular humps. Primary valve carrying 2 simple, short and thick setæ issuing somewhat within the margin diagonally almost in the direction of the angles of the parent cell.

*Period of Vegetation.* The whole year. Spores from March to June.

*Occurrence.* Norw. N. Atlant. Exped. St. 296; Christiania Fjord, W.coast of Norway, Nov. 1893 (*Hjort*); Marstenen, June 1895 (*Hjort*); W.coast of Norway, Feb.

\*) *Cleve* (l. c. 1889, 1891) describes and figures terminal setæ of another shape and inclination; this, however, is probably accounted for by a confusion of this species with *Ch. diadema* or *Ch. constrictum*, both of which occur in his material from Gullmars Fjord; but both these species have the transversal setæ directed to the opposite side of the sagittal plane.



bruar—marts 96! Lofoten marts—april 96 (*Nordgaard*), Atlanterhavet mai 96 (*Bie*), vestkysten juni 96 (*S. Müller*).

*Udbredelse.* Atlanterhavet—Østersøen.

**20. *Chætoceros scolopendra*, Cl. (1896, 5) p. 30, fig. 4.**  
Tab. IV, fig. 52, 53.

Kjederne rette eller svagt uregelmæssig bøiede, oftest snoede, indhyllede i slim. Bredde 9—25  $\mu$ .

Cellerne i frontstilling rektangulære med afrundede hjørner og noget hvælvede skaller, foramina afrundet rektangulære, smalest paa midten.

Kromatofor 1, frontstillet.

Hornene temmelig tykke, gaaende ud lidt indenfor skallernes hjørner, krydsende hverandre ovenfor udgangspunktet, derefter afbøiede tvært paa filamentets længdeaxe i en S-formig bøjning, alle næsten parallelle med transversalaxen. De bærer til alle sider hule, forkislede haar, der synes at tjene som slimudsondrende organer.

Terminalhorn ikke forskellige fra de øvrige.

Hvileporer ukjendte.

*Vegetationstil.* Vinter og vaar.

*Forekomst.* Marstenen juni 95 (*Hjort*), Stavanger—Bergen februar 96 (*Nordgaard*), Drøbak marts 96! Atlanterhavet mai 96 (*Bie*).

*Udbredelse.* Atlanterhavet Skagerak.

*Chætoceros radicans*, Schütt (1895) p. 48 er nær beslægtet med denne art, men adskilles ved hornenes retning.

**21. *Chætoceros cinctum*, n. sp.**

Tab. II, fig. 23—27.

Kjederne rette eller uregelmæssig bøiede, bredde, 5—15  $\mu$ .

Cellerne i frontstilling rektangulære med budte hjørner, skallerne plane, foramina smalt rektangulære med afrundede hjørner.

Kromatofor 1, frontstillet.

Hornene udspringer indenfor skallernes hjørner og gaar først i skraa retning, indtil de krydser hverandre udenfor udgangspunktet, derefter tværs paa længdeaxen, divergerende en stump vinkel, to nærmest sagittalt, to transversalt til modsat side af sagittalplanet. Terminalhorn ikke forskellige fra de andre.

Ved sporedannelsen bliver modercellerne liggende parvis tæt indtil hinanden uden foramina og udstyres med eiendommelige, tykke, glatte horn, der først gaar sagittalt indbyrdes sammenvoksede, derefter omboies, saa at de danner en oval ring om kjeden. Sporerne ligger helt ensidig i modercellerne parvis med undersiderne mod hinanden, sammenvoksede med modercellens skal og horn.

1896 (*Nordgaard*); Drøbak, Feb., March 1896; Lofoten, March, April 1896 (*Nordgaard*); Atlantic Ocean, May 1896 (*Bie*); W.coast of Norway, June 1896 (*S. Müller*).

*Distribution.* Atlantic. Baltic.

**20. *Chætoceros scolopendra*, Cl. (1896, 5) p. 30, fig. 4.**  
Pl. IV, figs. 52, 53.

Chains straight or rather irregularly curved, generally twisted, often enveloped in mucilage. Width 9—25  $\mu$ .

Cells, in a front view, rectangular with rounded angles and somewhat convex valves, foramina rounded rectangular, narrowest in the middle.

Chromatophore, 1, in front.

Setæ rather thick, issuing a little within the corners of the valves, crossing one another above their insertion, then turning off perpendicular to the long axis of the filament in a sigmoid curve, all nearly parallel with the transverse axis. They carry on all sides hollow siliceous cilia, which appear to serve as mucilage-secreting organs. Terminal setæ not differing from the others.

Spores unknown.

*Period of Vegetation.* Winter and spring.

*Occurrence.* Marstenen, June 1895 (*Hjort*); Stavanger to Bergen, Feb. 1896 (*Nordgaard*); Drøbak, March 1896, Atlantic Ocean, May 1896 (*Bie*).

*Distribution.* Atlantic, Skagerak.

*Chætoceros radicans*, Schütt (1895) p. 48, is nearly allied to this species, but may be distinguished by the direction of the setæ.

**21. *Chætoceros cinctum*, n. sp.**

Pl. II, figs. 23—27.

Filaments straight or irregularly curved, 5—15  $\mu$  wide.

Cells, in a front view, rectangular with blunt angles, valves flat, foramina narrow rectangular, with rounded corners.

Chromatophore, 1, in front.

Setæ issuing from within the angles of the valves and going first in an oblique direction, until they cross one another beyond their insertion, then perpendicular to the longitudinal axis, diverging at an obtuse angle, two almost sagittally, two transversely to the opposite side of the sagittal plane. Terminal setæ not differing from the others.

By the spore-formation, the parent cells are left lying in pairs close to one another without foramina, and are furnished with peculiar, thick, smooth setæ, which first go in a sagittal direction, mutually coalesced, and then curve down so as to form an oval ring about the filament. The spores lie quite at one side in the parent cells, in pairs, with their lower surfaces towards one another, coalesced with the valves and setæ of the parent cell.

Primærskallerne røe eller kort tornede, afrundet konisk eller uregelmæssig pukkelformig hvælvede, sekundærskallerne plane.

*Vegetationstid.* Vaar og sommer.

*Forekomst.* Marstenen juni 95 (*Hjort*), Atlanterhavet mai 96 (*Bie*), Bergensfjorden juni—august 96 (*Nordgaard*).

*Udbredelse.* Atlanterhavet Nordsøen.

*Ch. cinctum* er sandsynligvis nær beslegtet med *Ch. incurvum*, Bail., der dog ifølge *Brightwell's* (l. c. fig. 11) kopi afviger ved følgende karakterer: Sporemodercellerne slutter ikke tæt indtil hinanden, men adskilles ved lancetformede foramina, deres horn er ved grunden snoede om hverandre, men ikke sammenvoksede.

Derimod er *Ch. incurvum* Brightw. sandsynligvis identisk med *Ch. cinctum*.

## 22. *Chætoceros furcellatum*, Bail. (1856) T. I, fig. 4.

*Cl. og Grun.* (1880) p. 120, T. VII, fig. 136—137.

*Cl.* (1896, 4) p. 7, T. II, fig. 6—7 (ikke identisk med *Ch. vermiculus*, Schütt).

Meget nær beslegtet med *Ch. cinctum*, fra hvilken den er vanskelig at skille i steril tilstand. Den bliver noget grovere (kjedens bredde 8—20  $\mu$ ), og hornene divergerer en ret vinkel, altsaa noget mindre end hos *Ch. cinctum*.

Sporemodercellernes horn er ved grunden sammenvoksede ligesom hos *Ch. cinctum*, derefter divergerer de en meget liden vinkel. \*)

*Vegetationstid.* Vaar, i Ishavet om sommeren og høsten.

*Forekomst.* N. Atlanterhav—Ishavet (Nordhavsexp.), Lofoten marts—april 96 (*Nordgaard*).

*Udbredelse.* N. Atlanterhav—Ishavet. Kamtschatka (*Bailey*).

## 23. *Chætoceros externum*, n. sp.

T. III, fig. 44, 45.

Kjederne faacellede, rette eller uregelmæssig boiede, bredde 10—20  $\mu$ . Cellerne i frontstilling rektangulære

\*) *Sars* omtaler i en af sine indberetninger, at der i Ishavet til sine tider findes „amorft protoplasma“, som han antager for et udviklingsstadium af en *Chætoceros*. Hans tegninger viser, at han sigter til *Ch. furcellatum*; det er vel lidet sandsynligt, at den eller nogen anden *Chætoceros* skulde have et saadant *Palmella*-lignende stadium.

*Chætoceros furcellatum* forekommer ved Lofoten og sandsynligvis ogsaa ofte i Ishavet sammen med *Phæocystis Poucheti* (Har.) Lagerh., der har membranløse celler indleirede i slim (kfr. Lagerh. 1896). Jeg skulde være tilbøjelig til at antage, at *Sars's* „amorfte protoplasma“ er denne eller en lignende art. Naar *Chætoceros*-kjederne kommer ind i *Phæocystis*-koloniernes sterkere lysbrydende slim, bliver horn og endog membraner utydelige, saa at en feiltagelse i tilfælde kunde forklares.

Primary valves rough or with short spines, conically rounded or irregularly humped; secondary valves flat.

*Period of Vegetation.* Spring and summer.

*Occurrence.* Marstenen, June 1895 (*Hjort*); Atlantic, May 1896 (*Bie*); Bergen Fjord, June to Aug. 1896 (*Nordgaard*).

*Distribution.* Atlantic Ocean, North Sea.

*Ch. cinctum* is probably nearly allied to *Ch. incurvum*, Bail., which, however, according to *Brightwell's* copy (l. c. fig. 11) differs in the following characters. The spore parent cells do not fit closely into one another, but are separated by lanceolate foramina, their setæ being twisted round one another at the base, but not coalesced.

*Ch. incurvum*, Brightw. on the other hand, is probably identical with *Ch. cinctum*.

## 22. *Chætoceros furcellatum*, Bail. (1856) Pl. I, fig. 4.

*Cl. and Grun.* (1880) p. 120, Pl. VII, figs. 136, 137.

*Cl.* (1896, 4) p. 7, Pl. II, figs. 6 and 7 (not identical with *Ch. vermiculus*, Schütt).

Very nearly allied to *Ch. cinctum*, from which it is difficult to distinguish it in a sterile condition. It becomes somewhat coarser (width of the filaments 8 to 20  $\mu$ ) and the setæ diverge at a right angle, in other words, rather less than in *Ch. cinctum*.

The setæ of the spore parent cells are coalesced at the base, as in *Ch. cinctum*, and then diverge at a very small angle. \*)

*Period of Vegetation.* Spring; in the Arctic Ocean, in summer and autumn.

*Occurrence.* N. Atlantic, Arctic Ocean (N. Atl. Exped.); Lofoten, March, April 1896 (*Nordgaard*).

*Distribution.* N. Atlantic, Arctic Ocean; Kamtschatka (*Bailey*).

## 23. *Chætoceros externum*, n. sp.

Pl. III, figs. 44, 45.

Filaments few-celled, straight or irregularly curved, 10 to 20  $\mu$  wide. Cells, in a front view, rectangular with

\*) *Sars*, in one of his reports, states that in the Arctic Ocean there is found at certain times „amorphous protoplasm“, which he supposes to be a developmental stage of a *Chætoceros*. His drawings show that he refers to *Ch. furcellatum*, but it is hardly probable that that, or any other *Chætoceros*, would have such a *Palmella*-like stage.

*Ch. furcellatum* occurs at Lofoten, and probably also often in the Arctic Ocean, together with *Phæocystis Poucheti* (Har.) Lagerh., which has membraneless cells embedded in mucilage (cf. Lagerh. 1896). I am inclined to think that *Sars's* „amorphous protoplasm“ is either this species, or one resembling it. When *Chætoceros* chains come into the more highly refractive mucilage of *Phæocystis* colonies, their setæ and even their membranes become indistinct, a fact which might explain a mistake of this kind.



med budte hjørner, skallerne plane eller svagt konvekse, foramina lancetformede, over dobbelt saa lange som kjedens bredde.

Kromatoferer 2, stillede op mod hver af skallerne.

Hornene traadformede, bøielige, gaaende ud fra skallerne hjørner næsten sagittalt, krydsende hverandre langt udenfor kjedens rand, ikke direkte sammenvoksede, men forbundne med en ganske kort (c. 1  $\mu$ ) streng, som ikke sees i frontstilling.

Hvilesporer ukjendte.

*Vegetationstid.* August—november.

*Forekomst.* Vallø (*Hjort*) og Gullmarsfjord, Bohuslän (*Cleve*) i november 93, Drøbak august 96 (frk. *Bonnevie*).

*Udbredelse.* Skagerak.

*Ch. externum* er beslegtet med *Ch. anastomosans*, Grun. in V. H. Synopsis, T. 82, fig. 6—8 og med *Ch. (anastomosans  $\beta$ ) speciosum*, Schütt (1895) p. 47, fig. 26; fra disse adskilles den ved den meget kortere forbindelsessstift mellem hornene.

**24. *Chætoceros sociale*, Lauder (1864) p. 77, T. VIII, fig. 1.**

Tab. IV, fig. 54.

Kjederne bøiede, med løst sammenhængende celler, 4.5—15  $\mu$  brede, flere forenede ved et fælles slimhülle til uregelmæssig kugleformede kolonier.

Cellerne i frontstilling rektangulære-kvadratiske med budte hjørner. Skallerne næsten plane eller med en svag hvælving paa midten, foramina smale, afrundet rektangulære.

Kromatofer 1, frontstillet.

Hornene springer ud lidt indenfor hjørnerne og krydses lidt udenfor udgangspunkterne; de to, som ligger koloniens yderside nærmest, er rettede næsten sagittalt, spidsvinklet divergerende; de to andre er enten begge omboiede mod samme sagittalside eller det ene omboiet, det andet ret, forlænget i sagittal retning ind til koloniens centrum, hvor flere lignende forlængede horn er sammenfildrede.

Hvilesporer noget ensidig i modercellerne, glatte, begge skaller næsten ensformede, afrundet konisk eller pukkelformig hvælvede.

*Vegetationstid.* Februar april, hvilesporer i marts—april.

*Forekomst.* Vestkysten februar 96 (*Nordgaard*), Christianiafjorden februar—marts 96! Lofoten marts—april 96 (*Nordgaard*).

*Udbredelse.* Hongkong, Atlanterhavet—Skagerak, Ishavet, sandsynligvis kosmopolitisk.

**25. *Chætoceros radians*, Schütt (1895) p. 41, fig. 10 a—c.**

Meget nær beslegtet med *Ch. sociale*, fra hvilken den alene skilles ved bredere foramina, næsten lige

blunt angles, valves flat or slightly convex, foramina lanceolate, more than double as long as the filament is wide.

Chromatophores, 2, one close to each valve.

Setæ filiform, flexible, issuing in almost a sagittal direction from the angles of the valves, crossing one another far beyond the margin of the filament, not directly coalesced, but connected by quite a short cord (about 1  $\mu$ ) which is not visible in a front view.

Spores unknown.

*Period of Vegetation.* Aug. to Nov.

*Occurrence.* Vallø (*Hjort*) and Gullmars Fjord, Bohuslän (*Cleve*), Nov. 1893; Drøbak, Aug. 1896 (Miss *Bonnevie*).

*Distribution.* Skagerak.

*Ch. externum* is related to *Ch. anastomosans*, Grun. in V. H. Synopsis, Pl. 82, figs. 6—8, and with *Ch. (anastomosans  $\beta$ ) speciosum*, Schütt (1895) p. 47, fig. 26. It is distinguished from them by the much shorter connecting cord between the setæ.

**24. *Chætoceros sociale*, Lauder (1864) p. 77, Pl. VIII, fig. 1.**

Pl. IV, fig. 54.

Filaments curved, with loosely connected cells, 4.5—15  $\mu$  wide, several united by a common gelatinous investment into irregularly spherical colonies.

Cells, in a front view, rectangular to square, with blunt angles. Valves almost flat, or with a slight convexity in the middle, foramina narrow, rounded rectangular.

Chromatophore, 1, in front.

Setæ issuing from a little within the angles, and crossing a little beyond their insertion; the two situated nearest to the outer side of the colony are directed almost sagittally, diverging at an acute angle; the other two are either both bent down towards the same sagittal side, or one is bent down, the other straight, produced in a sagittal direction as far as the centre of the colony, where several such elongated setæ are matted together.

Spores rather on one side in the parent cells, smooth, valves almost alike, vaulted in a rounded conical shape or in a hump.

*Period of Vegetation.* February to April; spores in March and April.

*Occurrence.* W.coast of Norway, Feb. 1896 (*Nordgaard*); Christiania Fjord, Feb. and March 1896; Lofoten, March and April 1896 (*Nordgaard*).

*Distribution.* Hongkong; Atlantic Ocean, Skagerak, Arctic Ocean; probably cosmopolitan.

**25. *Chætoceros radians*, Schütt (1895) p. 41, fig. 10 a—c.**

Very nearly allied to *Ch. sociale*, from which it differs only in having wider foramina—almost as wide as



saa brede som cellerne, og ved hvilesporerne, som paa primærskallen bærer korte torne.

*Vegetationstid.* Høst.

*Forekomst.* Drøbak, september 96.

*Udbredelse.* Østersøen—Christianiafjorden.

- 26. *Chætoceros Wighami*, Brightw. (1856) p. 108, T. VII, fig. 19—36.**  
 Tab. IV, fig. 50.  
 Descr. *Brightw.* l. c.

Til denne art har jeg troet at maatte henføre en form fra det nordlige Atlanterhav ( $66^{\circ}$  N. br.,  $30\frac{1}{2}^{\circ}$  L. W., *Haslum*), som er afbildet paa T. IV, fig. 50.

Kromatofoer 1, frontstillet med et stort pyrenoid paa midten. Kjedens bredde  $10\ \mu$ .

Identiteten er vanskelig at fastslaa uden hvilesporer.

- 27. *Chætoceros biconcavum*, n. sp.**  
 Tab. III, fig. 46.

Kjederne rette, faacellede, bredde  $7-15\ \mu$ . Cellerne i frontstilling rektangulære med skarpe hjørner og budefor. mig konkave skaller, foramina bredt lancetformede.

Kromatofoer 1. frontstillet.

Hornene tynde, udspringende fra skallernes hjørner, krydsende hverandre ved udgangspunktet, sterkt afbøiede mod kjedens ender. Terminalhorn neppe tykkere end de øvrige.

*Vegetationstid.* Sommer.

*Forekomst.* Bergensfjorden juni—august 96 (*Nordgaard*).

Denne art er meget nær beslegtet med *Ch. Wighami*, fra hvilken den afviger ved de bredt lancetformede foramina; maaske er den kun en sommerform af denne. Hvilesporer har jeg endnu ikke fundet, hvorfor jeg endnu ikke vover at afgjøre identiteten.

Den er ogsaa beslegtet med *Ch. bottnicum*, Cl. in *Aurivillius* (1896) p. 14, T. I.

- 28. *Chætoceros gracile*, Schütt (1895) p. 42, fig. 13 a—d.**  
 Cellerne enkeltvis, ikke forenede i kjeder ( $S=6-10\ \mu$ ), i frontstilling rektangulære med svagt fremspringende hjørner. Skallerne konkave, ofte med en fin torn i midten.

Kromatofoer 2, sagittaltstillede.

Hornene fra cellernes hjørner, bøiede.

Hvilesporer (if. *Schütt*) med ensformig hvælvede, ru eller kort tornede skaller.

*Vegetationstid.* November—marts.

*Forekomst.* Christianiafjord november 93 (*Hjort*), februar—marts 96! Gullmarsfjord, Bohuslän novbr. 93 (*Cleve*).

*Udbredelse.* Østersøen—Skagerak.

the cells—and in the spores, which, in the primary valve, carry short spines.

*Period of Vegetation.* Autumn.

*Occurrence.* Drøbak, Sept. 1896.

*Distribution.* Baltic, Christiania Fjord.

- 26. *Chætoceros Wighami*, Brightw. (1856) p. 108, Pl. VII, figs. 19—36.**  
 Pl. IV, fig. 50.  
 Descr. *Brightw.* l. c.

I have thought it advisable to refer to this species a form from the N. Atlantic Ocean ( $66^{\circ}$  N. Lat.,  $30\frac{1}{2}^{\circ}$  W. Long. *Haslum*), figured on Pl. IV, fig. 50.

Chromatophore, 1, in front, with a large pyrenoid in the middle. Filaments  $10\ \mu$  wide.

It is difficult to identify without spores.

- 27. *Chætoceros biconcavum*, n. sp.**  
 Pl. III, fig. 46.

Filaments straight, few-celled, width  $7-15\ \mu$ . Cells, in a front view, rectangular with sharp angles, and arcuate valves; foramina broadly lanceolate.

Chromatophore, 1, in front.

Setæ thin, issuing from the angles of the valves, crossing one another at their insertion, turning sharply off towards the ends of the filament. Terminal setæ scarcely thicker than the others.

*Period of Vegetation.* Summer.

*Occurrence.* Bergen Fjord, June to Aug. 1896 (*Nordgaard*).

This species is very nearly allied to *Ch. Wighami*, from which it differs in having broad lanceolate foramina: possibly it is only a summer form of that species. I have not yet found spores, and cannot therefore venture to determine its identity.

It is also related to *Ch. bottnicum*, Cl. in *Aurivillius* (1896) p. 14, Pl. I.

- 28. *Chætoceros gracile*, Schütt (1895) p. 42, fig. 13 a—d.**  
 Cells single, not united in chains ( $S=6-10\ \mu$ ), in a front view, rectangular, with slightly projecting angles. Valves concave, often with a fine spine in the middle.

Chromatophores, 2, situated sagittally.

Setæ from the angles of the cells, curved.

Spores (according to *Schütt*) with valves equally convex, rough or covered with short spines.

*Period of Vegetation.* Nov. to March.

*Occurrence.* Christiania Fjord. Nov. 1893 (*Hjort*), Feb. and March 1896; Gullmars Fjord, Bohuslän, Nov. 1893 (*Cleve*).

*Distribution.* Baltic, Skagerak.

**Melosira.**

**Melosira solida**, Eul. in V. H. Synops. T. 86, fig. 36—42.  
var. *Sarsii*, n. var.  
Tab. IV, fig. 64—66.

Kjedernes diameter 7—12  $\mu$ .

Denne form findes i de fleste af Nordhavsexpeditionens prøver og desuden i atlantisk plankton samlet af *Nordgaard* i februar 96 og af *Bie* i mai 96. Den maa altsaa være en ægte saltvandsform, medens den nærmeste slegtninge er ferskvands- eller brakvandsformer.

**Thalassiosira, Cl.**

**Thalassiosira Nordenskiöldii**, Cl. (1873, 13) p. 6, T. II, fig. 1.  
Fig. V. H. Synopsis. T. 83, fig. 9.  
Tab. IV, fig. 59.

Cellerne er 12—43  $\mu$  i diameter, i frontstilling næsten ottekantede med et mindre antal sterke, i spidsen fortykkede tagger langs skallens indre rand. Ved en central slimtraad hænger de sammen i tætte, bugtede kjeder; mellemrummene er smallere end cellernes diameter (2—7  $\mu$ ). Gjennem taggerne udgaar slimtraade i forskellige retninger, ligesom ogsaa undertiden hele kjeden kan omgive sig med slim.

Hvilesporer (Tab. IV, fig. 59) dannes, idet protoplasmaet trækker sig tilbage fra den ene skal tæt ind til den anden og danner en ny skal indeni denne.

*Udbredelse.* Atlanterhavet—Ishavet—Østersøen, ved vore kyster især vinter og vaar.

**Thalassiosira gravida**, Cl. (1896, 4) p. 12, T. II, fig. 14—16.  
Tab. IV, fig. 57, 58.

Cellernes diameter 17—62  $\mu$ . Cellerne i frontstilling rektangulære med afrundede hjørner, langs randen med flere rader korte tagger, forenede i kjeder ved temmelig lange, tykke, i midten indsnævrede slimstrengene.

Hvilesporer beskrevne af *Cleve*.

Auxosporedannelsen er afbildet paa fig. 57—58, T. IV. Cellerne fylder sig da med protoplasma, skallerne viger fra hinanden, og protoplasmaet omgiver sig først med et tyndt, bøieligt hylle, derefter med to fastere skaller indeni dette. Disse skaller er hvælvede, altsaa forskellige fra de almindelige. Derefter begynder den nye celle, hvis diameter er omtrent  $\frac{2}{3}$  af den gamle, at dele sig, saa at der dannes nye kjeder i forlængelsen af den gamle. I almindelighed danner de fleste celler i kjeden omtrent samtidig auxosporer.

*Udbredelse.* Atlanterhavet—Ishavet—Skagerak, ved vore kyster især vinter og vaar.

**Melosira.**

**Melosira solida**, Eul. in V. H. Synopsis, Pl. 86, figs. 36—42.  
var. *Sarsii*, n. var.  
Pl. IV, figs. 64—66.

Diameter of filaments 7—12  $\mu$ .

This form is found in most of the North Atl. Exped. samples, and also in Atlantic plankton collected by *Nordgaard* in February 1896, and by *Bie* in May 1896. It must therefore be a true salt-water form, while those most nearly related to it are fresh or brackish water forms.

**Thalassiosira, Cl.**

**Thalassiosira Nordenskiöldii**, Cl. (1873, 13) p. 6, Pl. II, fig. 1.  
Fig. V. H. Synopsis, Pl. 83, fig. 9.  
Pl. IV, fig. 59.

Cells 12—43  $\mu$  in diameter, in a front view almost octagonal, with a small number of strong denticles, thickened at the point, running along the inner margin of the valve. They are connected by a central mucilaginous thread in close, wavy chains; the intervals are narrower than the diameter of the cells (2—7  $\mu$ ). Mucilaginous threads run through the denticles in various directions, and sometimes the whole chain is enveloped in mucilage.

Spores (Pl. IV, fig. 59) are formed by the drawing back of the protoplasm from one valve close up to the other, and the forming of a new valve within the latter.

*Distribution.* Atlantic Ocean, Arctic Ocean, Baltic; on our coasts (Norway) particularly in winter and spring.

**Thalassiosira gravida**, Cl. (1896, 4) p. 12, Pl. II, figs. 14—16.  
Pl. IV, figs. 57, 58.

Diameter of the cells, 17—62  $\mu$ . Cells, in a front view, rectangular, with rounded angles, and several rows of short denticles along the margin, united in chains by rather long, thick mucilaginous cords narrowed in the middle.

Spores described by *Cleve*.

Auxospore formation figured in figs. 57 and 58, Pl. IV. The cells are then filled with protoplasm, the valves retreat from one another, and the protoplasm is enclosed first in a thin, flexible investment, then in two firmer valves within this. These valves are convex, thus differing from the ordinary ones. Next, the new cells, whose diameter is about  $\frac{2}{3}$  of that of the old ones, begin to divide, so as to form new chains in continuation of the old one. Generally most of the cells in the chain form auxospores at about the same time.

*Distribution.* Atlantic Ocean, Arctic Ocean, Skagerak; on our coasts (Norway) especially in winter and spring.



**Thalassiosira Clevei**, n. sp.

Tab. IV, fig. 60—62.

I nogle planktonprøver, samlede af *Haslum* i det nordvestlige Atlanterhav paa omtrent 66° N. br. og 30° L. W. findes i store mængder en *Thalassiosira*, der er forskjellig fra *Th. gravida*, med hvilken den forekommer sammen.

Cellerne er skiveformede, i frontstilling fladt rektangulære med budte hjørner, 16.5—42  $\mu$  i diameter, ved en central slimstreng forenede i bugtede kjeder med uregelmæssige intervaller, snart 2—4 eller flere celler tæt sammen, snart et bredere mellemrum med en ganske tynd forbindende traad.

Skallerne bærer i randen en enkelt tæt række af korte tagger, 6—7 paa 10  $\mu$ . Paa et enkelt sted desuden en grovere knude lidt indenfor taggernes cirkel; disse knuder, der paa de to tilsvarende skaller staar diametralt modsat, synes at danne kanaler for slimtraade.

Skallernes masker omtrent som hos *Th. gravida*, paa de af mig undersøgte exemplarer 13—16 paa 10  $\mu$ .

Prøverne er tagne om sommeren, og derfor er alle arters cellevægge tynde, svagt forkislede, og skallernes struktur er vanskelig at se; *Th. Clevei* er nær beslegtet med *Coscinodiscus kryophilus*, Grun. (1884) Pl. III, fig. 21, maaske vil den vise sig at være identisk med denne art.

Hvilesporer og auxosporer ukjendte.

*Forekomst.* N. V. Atlanterhav (*Haslum*), Lofoten marts—april 96 (*Nordgaard*).

**Coscinodiscus**, Ehr.

Af denne slekt er der efter skallernes struktur beskrevet et meget stort antal arter. Naar disse arter bliver nærmere kjendte i levende tilstand, vil visselig opfatningen af deres systematiske forhold blive meget forandret, og slekten vil ved biologiske karakterer blive opdelt i flere nye slekter.

En begyndelse hertil er skeet ved oprettelsen af slekten *Thalassiosira*, en adskillelse, som efter min mening er vel berettiget. Til denne slekt vil sandsynligvis ikke faa af de nuværende *Coscinodiscus*-arter maatte henføres.

I det følgende har jeg opført to arter, som uden tvil burde udskilles fra slekten; men da jeg endnu kun har havt anledning til at undersøge et lidet antal arter, vil jeg foreløbig henføre dem til *Coscinodiscus*.

**Thalassiosira Clevei**, n. sp.

Pl. IV, figs. 60—62.

In some plankton samples collected by *Haslum* in the north-western Atlantic, in about 66° N. Lat. and 30° W. Long., a *Thalassiosira* is found in great quantities, which is different to *Th. gravida*, in whose company it is found.

The cells are lamelliform, in a front view of a flat rectangular shape, with blunt angles, 16.5—42  $\mu$  in diameter, connected by a central mucilaginous cord in wavy chains with irregular intervals, sometimes from 2 to 4 or more cells close together, sometimes a wider interval with quite a thin connecting thread.

The valves carry at the margin a single, close row of short denticles, 6 or 7 in 10  $\mu$ . There is moreover, at one place, a larger protuberance a little within the circle of denticles. These protuberances, which are diametrically opposite to one another on the two corresponding valves, appear to form channels for the mucilaginous threads.

The striae of the valves almost as in *Th. gravida*; in the specimens I examined, there were from 13 to 16 in 10  $\mu$ .

The samples were taken in the summer, and therefore the cell walls of all the species are thin and slightly siliceous, and it is difficult to see the structure of the valves. The species is nearly allied to *Coscinodiscus kryophilus*, Grun. (1884) Pl. III, fig. 21; it may possibly be identical with it.

Spores and auxospores unknown.

*Occurrence.* N. W. Atlantic Ocean (*Haslum*); Lofoten, March, April 1896 (*Nordgaard*).

**Coscinodiscus**, Ehr.

A very large number of species of this genus have been described from the structure of the valves. When these species become better known in a living state, opinions concerning their systematic conditions will certainly be greatly changed, and the genus divided by biological characters into several new genera.

A step towards this has been made by the establishment of the genus *Thalassiosira*, a separation which, in my opinion, is thoroughly justifiable. It is probable that no small number of the present *Coscinodiscus* species will have to be referred to *Thalassiosira*.

I give below two species which ought without doubt to be separated from the genus; but having, as yet, only had the opportunity of examining a small number of species, I will in the mean time refer them to *Coscinodiscus*.



**Coscinodiscus excentricus, Ehr. var. catenata, Gran mscr.**

Fig. A. Schmidt (1875) T. III, fig. 36—38.

V. H. Synopsis, T. 130, fig. 4, 7, 8.

*Coscinodiscus excentricus* var. Cl. (1896, 5) p. 7.

Cellerne i frontstilling rektangulære med budte hjørner, i diameter 12—38  $\mu$  eller mere, ved en central slimstreng forenede til korte kjeder, med store intervaller mellem cellerne. Marginaltaggerne noget fortykkede i spidsen, lignende taggerne hos *Thalassiosira Nordenskiöldii*.

Denne art burde efter min mening henføres til *Thalassiosira*; derimod er den ikke, som Cleve antager, en hvilesporeform af *Th. Nordenskiöldii*, Cleve (1896, 4, p. 13). Maaske maa dog var. *catenata* adskilles fra den ægte *C. excentricus*, Ehr.

*Forekomst.* Ved Norges kyster især høst og vaar.

**Coscinodiscus polychordus, n. sp.**

T. II, fig. 33; T. IV, fig. 56.

Cellerne i frontstilling rektangulære med budte hjørner og plane skaller, i sidestilling cirkulære, 24—76  $\mu$  i diameter.

Skallerne noget indenfor midten af radien med en kreds af 5—7 buelformige knuder (stigmata), nær randen med en enkelt række sterke tagger, som er noget nedløbende ved roden. Skallerne areolerede, maskerne ordnede i retlinjede rækker, som gaar ud fra centrum i lige saa mange retninger, som der er stigmata; skallen paa denne maade delt i 5—7 sektorer med stigmata som midtpunkter; indenfor hver sektor er linjesystemerne indbyrdes parallele, mellem sektorerne kan findes pludselige eller buelformede brud. Undertiden optræder smaa kileformede segmenter nær randen med selvstændige radiallinjer. De seksdelte individer er de hyppigste; hos disse kan linjesystemerne over hele skallen være parallele som hos *Coscinodiscus lineatus*, Ehr. Maskerne 10—11, sjældnere 13 paa 11  $\mu$ . Udenfor taggerne er randen besat med tætte radiale linjer.

Cellerne er forenede i kjeder (T. IV, fig. 56), idet der gennem stigmata gaar slimtraade, der binder dem sammen. Denne karakter adskiller den fra *C. lineatus*, Ehr., hvilken den forøvrigt ligner; jeg anser for at være saa betydningsfuld, at *Coscinodiscus polychordus* burde opstilles som type for en egen slekt.

*Forekomst.* Christianiafjorden—Vestkysten februar—marts 1896, N. V. Atlanterhav sommeren 96 (*Haslum*).

**Asteromphalus, Ehr.****Asteromphalus atlanticus** Cl. (1896, 4) p. 5.

Til denne art har jeg henført den form, som er afbildet paa T. IV, fig. 63; den findes, om end sparsomt, i flere af Nordhavsekspeditionens prøver. Diameter 42  $\mu$ , segmenternes masker ca. 10 paa 10  $\mu$ .

**Coscinodiscus excentricus, Ehr. var. catenata, Gran mscr.**

Fig. A. Schmidt (1875) Pl. III, figs. 36—38.

V. H. Synopsis, Pl. 130, figs. 4, 7, 8.

*Coscinodiscus excentricus* var. Cl. (1896, 5) p. 7.

Cells, in a front view, rectangular with blunt angles, 12—38  $\mu$  or more in diameter, united by a central mucilaginous cord into short chains with wide intervals between the cells. Marginal denticles somewhat thickened at the point, resembling those in *Thalassiosira Nordenskiöldii*.

This species ought, in my opinion, to be referred to *Thalassiosira*; on the other hand, it is not, as Cleve supposes, a spore-form of *Th. Nordenskiöldii* (Cleve, 1896, 4, p. 13). Perhaps the variety *catenata* should be separated from the true *C. excentricus*, Ehr.

*Occurrence.* Coasts of Norway, especially in autumn and spring.

**Coscinodiscus polychordus, n. sp.**

Pl. II, fig. 33; Pl. IV, fig. 56.

Cells, in a front view, rectangular, with blunt angles and flat valves; in a side view, circular; 24—76  $\mu$  in diameter.

Valves somewhat within the middle of the radius, with a circle of from 5 to 7 arcuate projections (stigmata), and near the margin, a single row of strong denticles, which are rather decurrent at the root. Valves areolated, meshes disposed in straight rows, running out from the centre in as many directions as there are stigmata; valve divided in this way into from 5 to 7 sectors, with stigmata as their centre; within each sector the linear systems are mutually parallel, and between the sectors there may be sudden or arcuate breaks. Sometimes small, cuneate segments are found near the margin, with independent radiating striæ. The sex-partite specimens are the most frequently met with; their linear systems may be parallel over the whole valve as in *Coscinodiscus lineatus*, Ehr. Meshes, 10 or 11, occasionally as many as 13, in 10  $\mu$ . Beyond the denticles, the margin is closely covered with radiating striæ.

The cells are united in filaments (Pl. IV, fig. 56) by mucilaginous threads passing through the stigmata. This character distinguishes it from *C. lineatus*, Ehr. which it otherwise resembles; and I consider this of such importance as to justify its classification as the type of a special genus.

*Occurrence.* Christiania Fjord, W. coast of Norway, Feb. March 1896; N. W. Atlantic, summer of 1896 (*Haslum*).

**Asteromphalus, Ehr.****Asteromphalus atlanticus** Cl. (1896, 4) p. 5.

I have referred to this species the form figured on Pl. IV, fig. 63. It is found, though not in abundance, in several of the North Atlantic Expedition samples. Diameter, 42  $\mu$ ; number of meshes in the segments, 10 in 10  $\mu$ .

## Silicoflagellata.

### **Distephanus**, Haeckel.

**Distephanus speculum** (Ehr.) Haeckel.

**Dictyocha speculum**, Ehr.

Descr. et fig. *Borgert* (1891) p. 633.

Sparsomt i flere af Nordhavsexpeditionens prøver.

Synes at være almindelig udbredt, men sjelden i store mængder.

## Cilioflagellata.

### **Ceratium**, Ehr.

**Ceratium tripos** (O. F. Müller) Nitsch.

Sparsomt i Nordhavsexpeditionens materiale.

Var. *labradorica*, Schütt er en ishavsform, var. *tergestina*, Schütt, har en noget sydligere udbredelsē (kfr. Schütt, 1893).

**Ceratium fusus** (Ehr.) Duj.

Meget sparsomt i Nordhavsexpeditionens prøver, almindelig ved Norges kyster.

Tilslut er det mig en behagelig pligt at udtrykke min ærbødige tak til de herrer, som har bistaaet mig med dette arbejde, nemlig professor *P. T. Cleve*, som har stillet præparater og originalmateriale til min disposition, endvidere professorerne *H. Mohn*, *G. O. Sars* og *N. Wille*, dr. *Johan Hjort* og cand. real. *Nordgaard*.

## Silicoflagellata.

### **Distephanus**, Haeckel.

**Distephanus speculum** (Ehr.) Haeckel.

**Dictyocha speculum**, Ehr.

Descr. et fig. *Borgert* (1891) p. 633.

In small numbers in several of the N. Atlantic Expedition samples. Seems to be generally distributed, but rarely in large numbers.

## Cilioflagellata.

### **Ceratium**, Ehr.

**Ceratium tripos** (O. F. Müller) Nitsch.

In small numbers in the N. Atl. Exped. material.

Var. *labradorica*, Schütt, is an arctic form; var. *tergestina*, Schütt, has a rather more southern distribution (cf. Schütt, 1893).

**Ceratium fusus** (Ehr.) Duj.

Very rare in the N. Atlantic Expedition samples, common on the coasts of Norway.

In conclusion, I should like to express my respectful thanks to those gentlemen who have assisted me in this work, especially professor *P. T. Cleve*, who has placed preparations and original material at my disposal, and also to Professors *H. Mohn*, *G. O. Sars* and *N. Wille*, Dr. *Johan Hjort* and Mr. *O. Nordgaard*.

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## Figurforklaring.

### Tab. I.

1. *Chatoceros Brightwellii*, Cl. a. Kjede i frontstilling, b-c skaller i sidestilling, b oversiden af kjedens øverste celle.  $\frac{600}{1}$ .
2. *Chatoceros decipiens*, Cl., f. *hiemalis*, frontstilling.  $\frac{450}{1}$ .
3. *Ch. decipiens*, Cl., sidestilling.  $\frac{600}{1}$ .  
*Chatoceros laciniosum*, Schütt.  $\frac{600}{1}$ .
- 4, 5. Kjeder i frontstilling med hvileporer.
6. Kjede i sagittalstilling med hvileporer.
7. Sidestilling.  
*Chatoceros didymum*, Ehr.  $\frac{600}{1}$ .
8. Sidestilling.
- 9, 10. Hvileporer, med modercellernes horn.  
*Chatoceros constrictum*, Gran.
11. Frontstilling { med hvileporer.  $\frac{600}{1}$ .
12. Sagittalstilling {
13. Sidestilling.  $\frac{450}{1}$ .

### Tab. II.

- Chatoceros debile*, Cl.
14. Kjede, spiralsnoet.  $\frac{300}{1}$ .
15. Kjede, brudstykke, med hvileporer.  $\frac{600}{1}$ .  
*Chatoceros diadema* (Ehr.) Gran.  $\frac{600}{1}$ .
16. Frontstilling.
17. Sagittalstilling.
18. Frontstilling, med hvileporer.  
*Chatoceros Schüttii*, Cl.
- 19, 20. Kjeder i frontstilling med hvileporer.  $\frac{600}{1}$ .  
*Chatoceros Ralfsii*, Cl.
21. Brudstykke af kjede med hvilespore.  $\frac{600}{1}$ .  
*Chatoceros curisetum*, Cl.
22. Brudstykke af kjede i frontstilling med hvileporer.  $\frac{600}{1}$ .  
*Chatoceros cinctum*, Gran.
- 23, 24. Kjeder i frontstilling med hvileporer.  $\frac{600}{1}$ .
25. Sidestilling.  $\frac{600}{1}$ .
- 26, 27. Hvileporer, 26, frontstilling, 27 sidestilling.  $\frac{1000}{1}$ .  
*Chatoceros coronatum*, Gran.  $\frac{600}{1}$ .
28. Brudstykke af Kjede i frontstilling med hvilespore.
29. Sidestilling med spore.
30. Celle med spore, frontstilling.
31. Spore, frontstilling.

## Explanation of the Plates.

### Pl. I.

- Fig. 1. *Chatoceros Brightwellii*, Cl. a. Front view of filament; b, c, view of valves; b, superior surface of the upper cells of the filament.  $\frac{600}{1}$ .
2. *Chatoceros decipiens*, Cl., f. *hiemalis*, front view.  $\frac{450}{1}$ .
3. *Ch. decipiens*, Cl., side view.  $\frac{600}{1}$ .  
*Chatoceros laciniosum*, Schütt.  $\frac{600}{1}$ .
- 4, 5. Front view of filaments with spores.
6. Sagittal view of filament with spores.
7. Side view.  
*Chatoceros didymum*, Ehr.  $\frac{600}{1}$ .
8. Side view.
- 9, 10. Spores with setæ of parent cells.  
*Chatoceros constrictum*, Gran.
11. Front view; { with spores.  $\frac{600}{1}$ .
12. Sagittal view; {
13. Side view.  $\frac{450}{1}$ .

### Pl. II.

- Chatoceros debile*, Cl.
- Fig. 14. Filament, twisted spirally.  $\frac{300}{1}$ .
15. Portion of filament, with spores.  $\frac{600}{1}$ .  
*Chatoceros diadema* (Ehr.) Gran.  $\frac{600}{1}$ .
16. Front view.
17. Sagittal view.
18. Front view, with spores.  
*Chatoceros Schüttii*, Cl.
- 19, 20. Front view of filaments with spores.  $\frac{600}{1}$ .  
*Chatoceros Ralfsii*, Cl.
21. Portion of filament with spore.  $\frac{600}{1}$ .  
*Chatoceros curisetum*, Cl.
22. Front view of portion of filament with spores.  $\frac{600}{1}$ .  
*Chatoceros cinctum*, Gran.
- 23, 24. Front view of filaments with spores.  $\frac{600}{1}$ .
25. Side view.  $\frac{600}{1}$ .
- 26, 27. Spores; 26, front view, 27, side view.  $\frac{1000}{1}$ .  
*Chatoceros coronatum*, Gran.  $\frac{600}{1}$ .
28. Portion of filament, with spores: front view.
29. Side view, with spore.
30. Cell with spore; front view.
31. Spore; front view.



32. *Chaetoceros contortum*, Schütt.  
Kjede.  $600/1$ .

33. *Coscinodiscus polychordus*, Gran.  
Skal i sidestilling.  $1000/1$ .

### Tab. III.

34. *Chaetoceros decipiens*, Cl.  
Kjede i frontstilling af *f. interrupta*, Gran, med kromatoferer og cellekjerter.

35, 36. *Chaetoceros teres*, Cl.  $600/1$ .  
Kjeder i frontstilling, 35 med celleindhold, 36 med sporer.

37. *Chaetoceros didymum*, Ehr.  $600/1$ .  
*f. aestiva*, Gran i frontstilling med kromato-  
38. *f. autumnalis*, Gran forer og cellekjerter.

39. *Chaetoceros seiracanthum*, Gran.  $600/1$ .  
Kjede i frontstilling med celleindhold.  
40. Spore.

41. Brudstykke af kjede med sporer.

42. *Chaetoceros constrictum*, Gran.  $490/1$ .  
Kjede, delvis med celleindhold.

43. *Chaetoceros curvisetum*, Cl.  $600/1$ .  
Kjede i frontstilling med celleindhold og spore.

44. *Chaetoceros externum*, Gran.  $600/1$ .  
Kjede i frontstilling med celleindhold.  
45. Sidestilling med vedhæng af en celle i frontstilling.

46. *Chaetoceros biconcavum*, Gran.  
Kjede med celleindhold.  $600/1$ .

### Tab. IV.

47. *Chaetoceros Willei*, Gran; kjede med celleindhold.  $600/1$ .

48, 49. *Ch. furcellatum*, Bail.,  $600/1$ . 48, i frontstilling, 49 sidestilling.

50. *Ch. Wighami*, Brightw., med celleindhold.  $600/1$ .

51. *Ch. crinitum*, Schütt, sagittalstilling med celleindhold.  $600/1$ .

52, 53. *Ch. scolopendra*, Cl., 52 frontstilling, 53 sidestilling.  $600/1$ .

54. *Ch. sociale*, Lauder, frontstilling med hvilesporer.  $600/1$ .

55. *Ch. simile*, Cl., frontstilling.  $600/1$ .

56. *Coscinodiscus polychordus*, Gran, kjede med forbindelsesstrenger og celleindhold.  $450/1$ .

57. *Thalassiosira gravida*, Cl., auxosporedannelse.  $300/1$ .

58. " " "  $600/1$ .

59. *Th. Nordenskiöldii*, Cl., med hvilesporer.  $600/1$ .

60. *Th. Clerei*, Gran, kjede med celleindhold.  $600/1$ .

61, 62. " " " sidestilling.  $1000/1$ .

63. *Asteromphalus atlanticus*, Cl., skal i sidestilling.  $600/1$ .

64, 65. *Melosira solida* Eul, var. *Sarsii*, Gran, 64—65, frontstilling, 66 sidestilling.  $600/1$ .

67. *Rhizosolenia alata*, Brightw., var. *truncata*, Gran.  $600/1$ .

Fig. 32. *Chaetoceros contortum*, Schütt.  
Filament.  $600/1$ .

33. *Coscinodiscus polychordus*, Gran.  
Side view of valve.  $1000/1$ .

### Pl. III.

34. *Chaetoceros decipiens*, Cl.  
Front view of filament of *f. interrupta*, Gran, with chromatophores and cell-nuclei.

35, 36. *Chaetoceros teres*, Cl.  $600/1$ .  
Front view of filaments; 35, with cell-contents, 36, with spores.

37. *Chaetoceros didymum*, Ehr.  $600/1$ .  
*f. aestiva*, Gran i front view, with chroma-  
38. *f. autumnalis*, Gran tophores & cell-nuclei.

39. *Chaetoceros seiracanthum*, Gran.  $600/1$ .  
Front view of filament with cell-contents.  
40. Spore.

41. Portion of filament with spores.

42. *Chaetoceros constrictum*, Gran.  $490/1$ .  
Filament, partly with cell-contents.

43. *Chaetoceros curvisetum*, Cl.  $600/1$ .  
Front view of filament with cell-contents and spores.

44. *Chaetoceros externum*, Gran.  $600/1$ .  
Front view of filament with cell-contents.  
45. Side view, with cell in front view attached.

46. *Chaetoceros biconcavum*, Gran.  
Filament with cell-contents.  $600/1$ .

### Pl. IV.

Fig. 47. *Chaetoceros Willei*, Gran.; filament with cell-contents.  $600/1$ .

48, 49. *Ch. furcellatum*, Bail.  $600/1$ ; 48, front view, 49, side view.

50. *Ch. Wighami*, Brightw., with cell-contents.  $600/1$ .

51. *Ch. crinitum*, Schütt; sagittal view with cell-contents.  $600/1$ .

52, 53. *Ch. scolopendra*, Cl.; 52, front view, 53, side view.  $600/1$ .

54. *Ch. sociale*, Lauder; front view with spores.  $600/1$ .

55. *Ch. simile*, Cl.; front view.  $600/1$ .

56. *Coscinodiscus polychordus*, Gran; filament with connecting cords and cell-contents.  $450/1$ .

57. *Thalassiosira gravida*, Cl.; auxospore formation.  $300/1$ .

58. " " "  $600/1$ .

59. *Th. Nordenskiöldii*, Cl.; with spores.  $600/1$ .

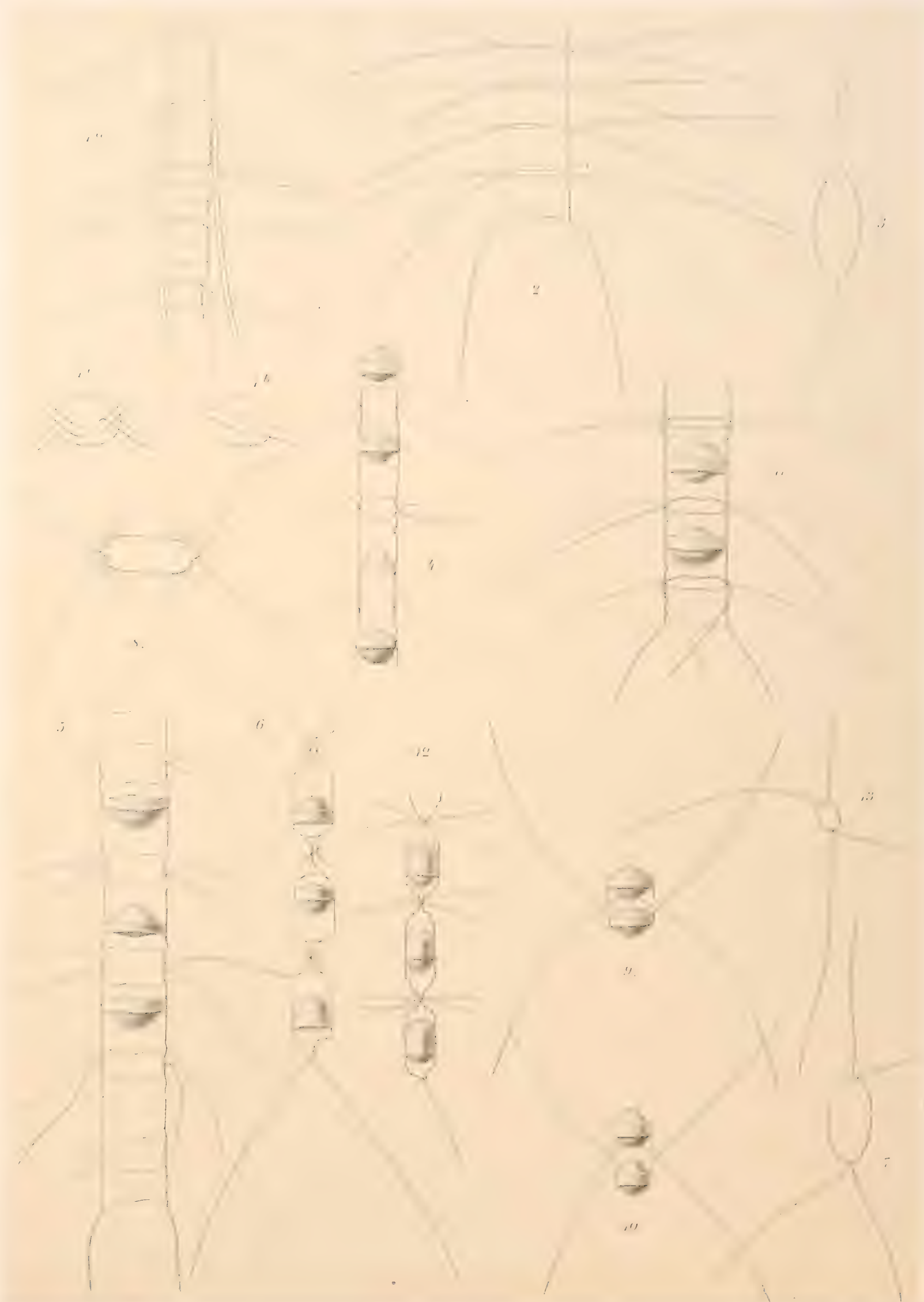
60. *Th. Clerei*, Gran; filament with cell-contents.  $600/1$ .

61, 62. " " " ; side view.  $1000/1$ .

63. *Asteromphalus atlanticus*, Cl.; side view of valve.  $600/1$ .

64—66. *Melosira solida*, Eul. var. *Sarsii*, Gran; 64, 65, front view, 66, side view.  $600/1$ .

67. *Rhizosolenia alata*, Brightw., var. *truncata*, Gran.  $600/1$ .



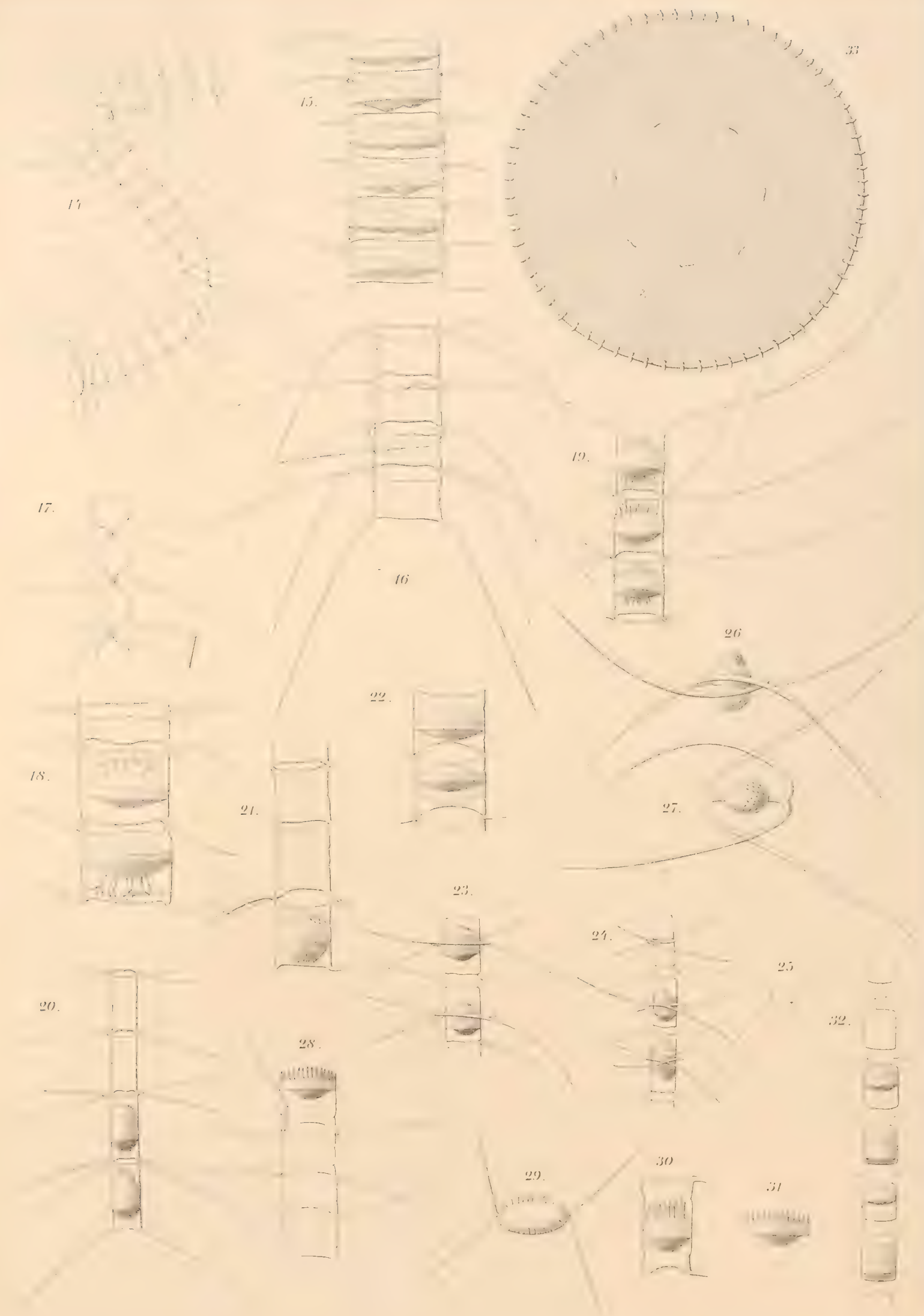
H. H. Gran del.

Lith. Anst. Julius Klinkhardt Leipzig.

1 *Chaetoceros Brightwellii* Cl. 2-3 *Chaetoceros decipiens* Cl. 4-7 *Chaetoceros lacinosum* Schütt.  
8-10 *Chaetoceros didymum* Ehr. 11-13 *Chaetoceros constrictum* Gran.







14-15 *Chaetoceros debile* Cl. 16-18 *Chaetoceros diadema* (Ehr.) Gran. 19-20 *Chaetoceros Schüttlii* Cl.  
 21 *Chaetoceros Ralfsii* Cl. 22 *Chaetoceros curvisetum* Cl. 23-27 *Chaetoceros cinctum* Gran.  
 28-31 *Chaetoceros coronatum* Grun. 32 *Chaetoceros contortum* Schütt. 33 *Coscinodiscus polychordus* Gran.

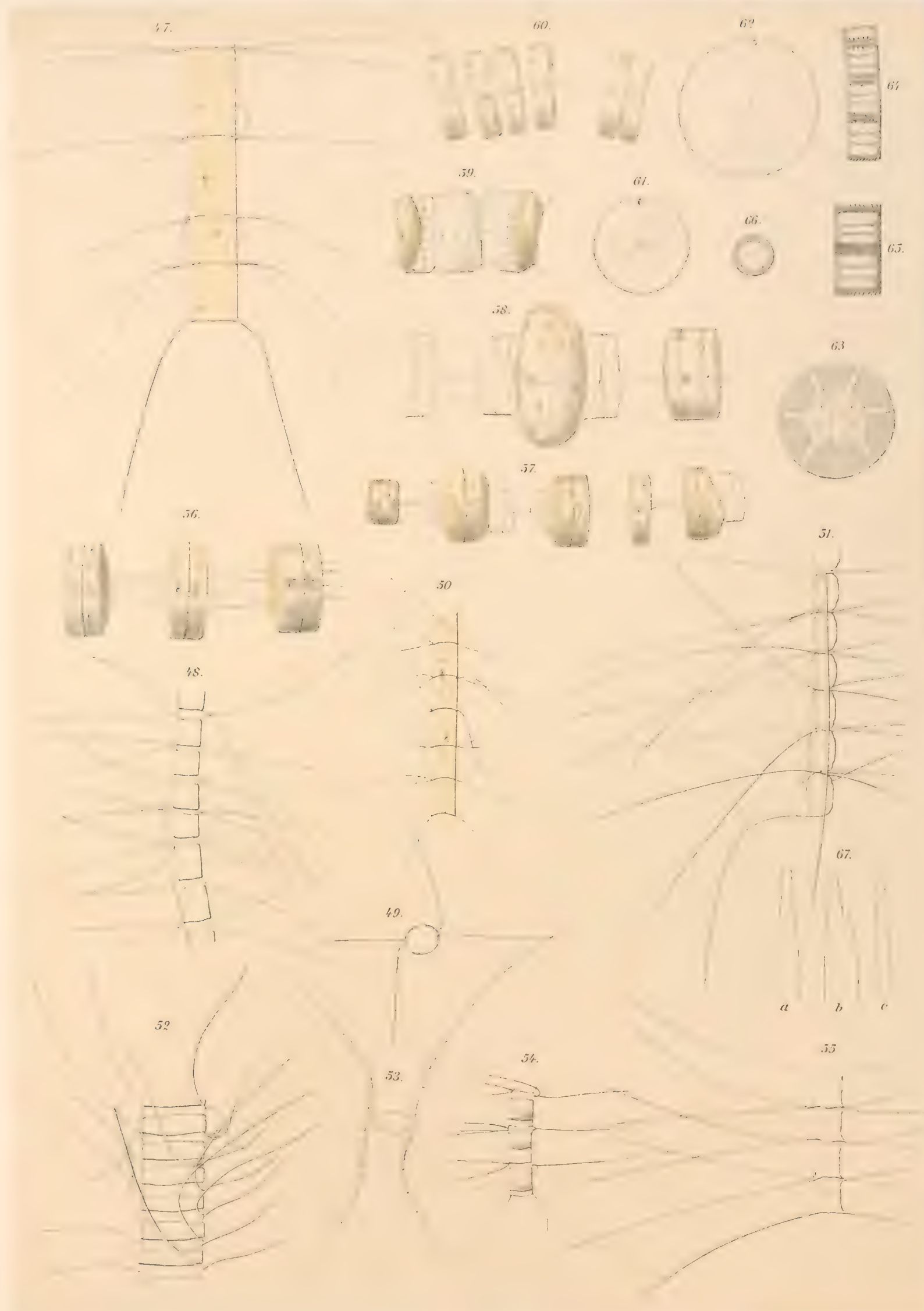




34. *Chaetoceros decipiens* Cl. 35-36. *Chaetoceros teres* Cl. 37-38. *Chaetoceros didymum* Ehr.  
 39-41. *Chaetoceros seiracanthum* Gran. 42. *Chaetoceros constrictum* Gran. 43. *Chaetoceros curvisetum* Cl.  
 44-45. *Chaetoceros externum* Gran. 46. *Chaetoceros biconcavum* Gran.







H. H. Gran del.

Lith. Anst. Julius Kunkel &amp; Co. Leipzig.

47. *Chaetoceros Willei* Gran. 48-49 *Chaetoceros furcellatum* Bail. 50 *Chaetoceros Wighami* Brightw.  
 51. *Chaetoceros crinitum* Schütt. 52-53. *Chaetoceros scolopendra* Cl. 54. *Chaetoceros sociale* Lauder.  
 55. *Chaetoceros simile* Cl. 56. *Coscinodiscus polychordus* Cran. 57-58. *Thalassiosira gravida* Cl.  
 59. *Thalassiosira Nordensköldii* Cl. 60-62. *Thalassiosira Clevei* Gran 63. *Asteromphalus atlanticus* Cl.  
 64-66. *Melosira solida* Eul. var. *Sarsii* Gran. 67. *Rhizosolenia alata* Brightw. var. *truncata* Gran.

















